MARINE REVIEW

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EMPLOYER AND EMPLOYED.

THEY HAVE REACHED DEFINITE AGREEMENTS REGARDING MILLIONS OF TONS OF ORE, COAL AND GRAIN TO BE HANDLED ON LAKE ERIE DOCKS DURING THE COMING SEASON.

D. J. Keefe, president of the International Longshoremen's Association, has done more in the past two weeks for the thousands of workmen employed on Lake Erie docks than any labor leader who has ever attempted to deal with the vast interests in ore, coal and grain—may be 35,000,000 tons—that are represented on these docks. He found the leaders in this industry ready to make a trial of dealings with organized labor and at wages largely in advance of previous years, but they wanted some assurance that in doing so they were not entering into a one-sided agreement that was to be broken upon the slightest provocation or alleged grievance from a few of the men on any of the numerous docks from Buffalo to Toledo. At the very outset, the president of the Longshoremen's Association inspired confidence from the business-like manner in which he took up every proposition and from his evident intention of using the power of the federation that he represented to enforce allegience to every agreement fairly entered into. Then the task of fixing the wages of ore and coal handlers, grain shovelers and the numerous branches of day labor was a difficult one, but it has all been done and there is every reason to expect that a season of business unequaled in the history of lake commerce is to pass without labor difficulties of any kind. Briefly stated the main features of agreements for the handling of coal, ore and grain are as follows:

Iron Ore—Twelve hours a day's work; price for unloading, 14 cents a ton; 25 cents an hour for overtime; for loading ore from dock by machine, 8 cents a ton; loading from dock by hand, 10 cents a ton; transfering from cars to dock 20 cents an hour; day work at rate of 20 cents an hour and overtime at 25 cents; gang bosses selected jointly by superintendent of docks and men interested; only legal holidays to be recognized except by mutual consent are Decoration day, July 4, Labor day and Thanksgiving day; no work on Sundays unless vessels are in a wrecked condition.

Handlers of soft coal—Unloading from cars to dock, 5 cents a ton; wheeling fuel aboard vessels and trimming in bunkers, 20 cents a ton; unloading from cars to buckets and trimming in bunkers, 19 cents; trimming in bunkers when fuel is put aboard through chutes, 8½ cents; these wages to apply to all Lake Erie ports except Buffalo. In the case of fuel lighters it is provided that the rate for unloading from cars and trimming in bunkers of vessels shall be 21 cents for all ports, and that the trimming in bunkers of vessels when lighters are loaded by the dock company shall be 12 cents. For trimming fuel put aboard vessel by car dumper or trestle the rate is 8½ cents; and for trimming all cargo, loaded by either car dumper or trestle, the rate is to be 3 cents for all vessels of 1,000 tons or less, and 2½ cents for all vessels over 1,000 tons. As regards the car dumping machines it is provided that operating engineers at Ashtabula are to be paid $85 a month and other engineers a relative advance of 23 per cent.; operating engineers at Cleveland, Lorain, Huron and Toledo to receive a relative advance of 23 per cent., excepting operating engineers on McMyler machine at Lorain, who are to receive $80; labor 20 cents an hour for 12 hours and 25 cents an hour for overtime; engineers drawing $80 a month to receive 40 cents an hour for overtime and 50 cents an hour for Sundays and holidays; engineers drawing $85 a month to receive 45 cents an hour for overtime and 55 cents for Sundays and holidays.

Hoisters and engineers on ore docks—wages $80 a month at all ports excepting Cleveland and Buffalo, $85 a month; overtime 40 cents an hour for men drawing $80 a month and 45 cents for men drawing $85; overtime on Sundays and legal holidays, 50 cents an hour for men drawing $80 a month and 55 cents for men drawing $85.

Buffalo grain shoveling—T. W. Kennedy, superintendent, to be employed and paid by the Lake Carriers' Association (it is understood that his salary will be $5,000 a year) and to be furnished with office assistants by the Lake Carriers' Association; men to be paid $2 per 1,000 bushels; boss scooper to act as timekeeper and his compensation (highman's pay and anything additional the men may elect) to be deducted from the pay of the men; local union and superintendent to select boss scoopers, with the right of discharge vested in superintendent, and with understanding that D. J. Keefe is to be called into conference in case of disagreement; all vessels started prior to 10 p. m. Saturday to be finished before quitting at regular rates, and for Sunday work and all boats started after 10 p. m. Saturday and finished on Sunday the price to be $3 per 1,000 bushels; 30 cents per hour for wet grain if scoopers are employed.

REVENUE CUTTER FOR THE GREAT LAKES.

It was expected that the contract for constructing the revenue cutter for the great lakes would be awarded this week, but the Townsend & Downey Shipbuilding & Repair Co. of New York, which is the lowest bidder, did not furnish evidence sufficiently satisfactory to the treasury officials that it could complete the contract on time and the award was not made. The company's representatives are now in Washington and insist that the boat can be turned out on time, and Assistant Secretary Spaulding is now reserving his decision pending further information. The company's bid was $151,000.

The committee on rivers and harbors will give another hearing April 4 on the Sault Ste. Marie power canal and Chairman Burton has so notified the interested parties. At that time the Sheldon bill, which was drafted by the power canal company, will be thoroughly discussed. The vessel interests are not by any means satisfied with its provisions.

COST OF SHIPS IN EUROPE AND AMERICA.

Senator Frye, in a recent interview on the shipping bill, made the statement that ships cost less to construct in Europe than in the United States, owing to the low wages paid abroad. In support of this statement Mr. Charles H. Cramp says:

"Most emphatically. The cost of building merchant ships is from 15 to 25 per cent. higher in this country than it is in other countries, and it will remain so as long as the present restricted demand for merchant ships continues in the United States. Our only hope of becoming a great maritime nation lies in the passage of such a bill as the one that has just been favorably reported to each branch of congress. From a builder's point of view, I know such an enactment would be of the utmost permanent benefit to the nation, and would inaugurate our maritime resuscitation. There need be no fear that one line or class of ships will be unduly favored. The bill prevents that very thing. It gives the same chance to each, and there is no monopoly possible for anyone.

"I notice that Senator Frye, in his interview discussed the relative cost of American and foreign warship building. The general public may not be aware that the United States is the only nation that advertises for bids for the construction of its warships. All other countries allot the construction of their warships to such builders as they are satisfied will build just the vessel desired. The price is either fixed by the government at the opening of negotiations, or arrived at during them. The contracts are made without competition, and the system has always operated satisfactorily abroad. The newspaper editor whom Senator Frye was answering had suggested that orders had been given for warships in this country by foreign governments because we built ships of that class as cheaply here as elsewhere. But that was not the reason at all. The placing of such contracts, by governments in the countries that do not build all of their own warships, is a matter of sentiment and confidence, very largely. Strong pressure was brought to bear on Russia to place all of her outside orders in Germany and France, where the great Russian loans had been secured. And, finally, orders were placed there largely because of that sentiment. But as to our firm, it so happened that the Russian admirals and navy department officials were friends of ours, and had had experience with our work. It was on this account that we were selected as the first firm to receive a contract outside of Russia for a modern battleship and first-class cruiser for the Russian government, and this, too, upon our own designs, plans and specifications.

"The Russian government," continued Mr. Cramp, "acts precisely as other European governments do in the matter of letting contracts for warships. It does as a private individual would, without advertising and without public bidding. It is the reputation of the builders that leads to direct negotiations."

In 1887 the Cramps rebuilt the engines in the second-class Russian cruiser Crayser, and in 1879 the same firm altered three merchant vessels into war vessels for the Russian government, and built for Russia one first-class cruiser, the Zabiaca.

THE CRUISER ALBANY.

It is expected that the cruiser Albany, which was purchased by the United States while under construction at the Armstrong works, Newcastle, Eng., during the Spanish war, will arrive in New York shortly.

This vessel is 330 feet in length over all, beam 43 feet 9 inches, and a maximum draught of 15 feet 10 inches. Her displacement with ammunition, stores, water and coal on board, is 3,954 tons. The indicated horse power of her twin engines is 7,500. During a recent trial in England she made 20.73 knots per hour under forced draft and 19.3 on a run of six consecutive hours under natural draft. The vessel is sheathed and coppered.

The Albany has a wide range of fire, and, like all vessels of her class, is distinguished for cruising area and qualities of speed. She will be a powerful fighter, but, owing to her lack of defensive qualities, a vulnerable one. Being entirely devoid of vertical side armor, she depends for protection upon a curved deck of steel, and her coal bunkers in the wake of the engines and boilers at the water line. The main battery of the Albany is made up of six 6-inch and four 4.7-inch rapid-fire guns, and the secondary battery consists of ten 6-pounder rapid-fire guns, eight 1-pounders and two Colts. One 6-inch gun is carried on the forecastle deck, another aft on the poop, the four others are carried in sponsons on the main deck in the waist of the vessel, two of the latter being forward on either beam, and two aft. The sides of the vessel are cut away so as to allow these four guns on the main deck to be fired directly forward or astern, parallel with the axis of the ship. The 4.7-inch guns are carried in broadsides on the main deck between the 6-inch guns. The battery of six-pounders is carried on the main deck, forecastle and poop, two of these being in the bow, two in the waist and two astern on the main deck, while the other four are carried on the forecastle and the poop. The vessel is provided with two military masts having four separate fighting tops, in which are distributed the one-pounders. The advantage of the arrangement of battery is that it enables the vessel to concentrate the fire of three 6-inch guns dead ahead and astern, while the broadside consists of four 6-inch and two 4.7-inch guns.

The normal coal capacity is 512 tons and the bunker capacity is about 88 tons.

The cruiser Boston will not be rebuilt. Rear Admirals Hichborn and O'Neil have been holding out against their associates on the board of construction in favor of expending but $350,000 on the Boston instead of rebuilding her at a cost of $750,000. Secretary Long has decided in favor of the former course. The repairs will fit the Boston for fifteen years further service.

MARINE HOSPITAL SERVICE.

REVIEW OF ONE OF THE MOST COMMENDABLE INSTITUTIONS EVER ESTABLISHED BY THE UNITED STATES GOVERNMENT—EXCELLENT WORK WHICH IT HAS DONE FOR THE SAILORS OF THE MERCANTILE MARINE.

Few persons have any idea whatever of the variety and scope of the work of the marine hospital service of the United States government. They little realize, indeed, how far-reaching are the measures for the preservation of their health; how, tirelessly, in all parts of the world men are working to keep disease out of the United States. On the theory that an ounce of prevention is worth a pound of cure, the marine hospital service works to keep infectious disease out of the country, and not merely to stamp it out after it gets in. For this purpose it has agents in all parts of the world. No sooner is the presence of a plague made known in any part of the globe than a member of the United States marine hospital service goes there to see that, by no chance, shall an afflicted person come to the United States. This is a task which requires the utmost delicacy and diplomacy, for there is at present no warrant for it in international agreement. Yet the marine hospital service has regular commissioned officers today at Naples, Cadiz, Barcelona, Marseilles, Havre, Bremen, Hamburg, Rotterdam, Antwerp, Genoa, London, Liverpool, Glasgow, Queenstown, Honolulu, Rio Janerio, Hong Kong and Kobe. These men act in a purely advisory capacity. If a native from an infected district seeks passage to the United States, and it is reasonable to suppose that he has been subjected to infection, the marine hospital officer advises him not to take the trip. He has no power to prevent him, but if the native persists in going he has only his trouble for his pains. The telegraph is faster than any steamship and he finds upon his arrival another marine hospital officer awaiting him to put him in quarantine, and, if necessary, to return him to his native heath. A measure, advocated by Representative Burton, is now before congress to place, through international negotiation, the United States marine hospital officer upon an official footing abroad.

DR. WALTER WYMAN,
Surgeon-General United States Marine Hospital Service.

The work of the marine hospital service in the war with Spain can not be over stated. It stands today as one of the greatest sanitary feats on record. A number of yachts and launches were bought and speedily turned into disinfecting and hospital ships. The service was called upon to bring 25,000 troops from Cuba, which had been directly and indirectly subjected to infection, and land them on American shores. At one time 12,000 of these troops were detained at a single camp. The work went on swiftly and the six quarantine stations disinfected, not only the 25,000 troops, but their baggage as well—and did it so thoroughly that not a single case of fever developed on American soil.

It may be safely said that the marine hospital service has learned to master the dreaded yellow fever. Less than a year ago a slight epidemic of this fever developed at Hampton, Va., and before it was discovered 3,500 persons had been exposed to the disease. The marine hospital service not only prevented its spread, but inside of three weeks it had effectually stamped out the fever altogether at Hampton. For the speedy suppression of a disease which had gained a pronounced foothold, this stands as a record. The service constantly keeps men on the Mexican border and at the fruit ports of Central America to inspect all shipments into this country. Some petulant merchants have said that this supervision is a hindrance to business, but few will question the contention of Surgeon-General Wyman that the purpose of the service is to facilitate commerce and to make it safe.

There are now six divisions to the marine hospital service—marine hospital division, division of domestic quarantine, division of foreign quarantine, division of accounts, division of statistics and public health reports, and miscellaneous division. The marine hospital service is almost as old as the general government itself. It was established, or rather provision was made for its establishment on July 16, 1798. For years prior to this time the leaven had been working, for in the house of representatives on Nov. 19, 1792, Representative Williamson used the following language:

"Wherever it is possible that sailors may be sick, there I would make provision for their support and comfort. Hospitals should be erected, or lodgings hired, as the case may be, at every port of entry in the United States for sick and infirm seamen,where they may be properly attended during their indispositions."

Hospital treatment, or its equivalent, was given to sick and disabled seamen by the marine hospital service in Boston as early as 1779, the year following the establishment of the service. The first marine hospital owned by the government and established under the act of 1798 was located at Washington Point, Norfolk county, Va. It was purchased by the United States in 1800. Three years later, in 1803, a marine hospital was completed for the port of Boston. It was located at Charlestown on the Mystic river. Provision was also made at that time for the establishment of a marine hospital at New Orleans. It was some years before the hospital was eventually established, but arrangements were made for the care of seamen at the local hospitals. Gradually the hospital service was extended to the principal ports along the Atlantic coast. A tax was collected from the seamen for their relief when sick or disabled, but the general government appropriated the money for building the hospitals.

In 1842 the service had gradually extended until hospitals had been authorized at Natchez, Miss.; Napoleon, Ark.; St. Louis, Mo.; Paducah, Ky.; Pittsburg and Cleveland. In 1873 there was finished at Chicago what was considered at that time to be the finest marine hospital in existence. Before the hospital was quite finished, however, Dr. Woodworth, the supervising surgeon-general, had reached the conclusion that a hospital costing one fourth the amount would answer the purposes of the service equally well. He had in mind the pavilion style of hospital which later became the standard style of the marine service.

The service was reorganized in 1870 by an act which empowered collectors of customs to collect from owners or masters of vessels arriving from a foreign port, or employed in the coasting trade, the sum of 40 cents for each seaman employed. The master was authorized to retain the amount from the wages of his employes. Nor was the service without proper recognition abroad. Within three years after its reorganization comments began to appear upon it in the foreign papers. In particular were the London journals profuse in their praise of this peculiarly American institution. The London Lancet recommended that the American system be adopted.

During 1878 a law was passed establishing a national quarantine and the supervising surgeon-general of the marine hospital service under the secretary of the treasury was empowered to frame regulations governing quarantine. During the same year the terrible epidemic of yellow fever occurred in the Mississippi valley and congress promptly passed another law establishing a national board of health. This law was operative for four years when the authority reverted to the marine hospital officials. In reviewing the history of the national quarantine service Supervising Surgeon-General Woodworth said:

"The supervision of ocean travel ought to be directed to securing good sanitary conditions for vessels at all times, out of as well as in port; a system of port sanitation should be adopted and administered for each country or place separately and should be modified in particular cases by taking into account the liability of the port to infection, the period of incubation of the disease, the length of time consumed in the voyage and the measures enforced by the vessel enroute. In some countries the detention of passengers and crews of ships hailing from infected ports is warranted, but for such time only as is necessary to complete the period of incubation of cholera or of yellow fever, counting from the date of departure of an infected port, or of landing from an infected vessel, and such vessel should not be detained beyond the period required for inspection and for thorough disinfection and cleansing. As far as America is concerned it is desirable that prompt and authoritative information should be had of the shipment of passengers or goods from districts infected with cholera or yellow fever, thereby insuring the thorough disinfection of infected articles."

Surgeon-General Woodworth died in March, 1879, and Surgeon John B. Hamilton was appointed in his stead. Meanwhile the policy inaugurated by Dr. Woodworth had taken root, and in 1886 Surgeon-General Hamilton recommended that the national quarantine stations be made permanent and that they be equipped with all the necessary appliances known to modern sanitary science for the treatment of infected vessels and their cargoes. Accordingly, in 1887, the national quarantines on the Atlantic and Pacific coasts were made permanent institutions and $500,000 was appropriated to establish three stations on the Pacific coast. Surgeon-General John B. Hamilton resigned in 1891 and President Harrison appointed Surgeon Walter Wyman, then on duty in the bureau as chief of the quarantine division, to succeed him.

In 1884 the hospital tax upon individual seamen was abolished and a tonnage tax, received from foreign vessels, was substituted. The service is varied in its scope. While originally established and at present maintained for the benefit of the mercantile marine, its good offices are extended to the navy as well. The physical examination of candidates for appointment in the revenue cutter service, and of officers for promotion in the service, are made by medical officers of the marine hospital service. Applicants for appointment for keeper or surfmen in the United States life saving service are also examined as to their physical condition and, if appointed, instructed in methods for the resuscitation of the apparently drowned. Pilots must also pass an examination before a medical officer of the marine hospital service as to their ability to distinguish the colored lights used at sea.

The headquarters of the supervising surgeon-general are located in the Butler building on Capitol Hill in Washington. It is a most interesting place to visit. Experiments in the mastery of disease are constantly going on. The laboratory on the top floor is devoted to the development of germs of various diseases, the preparation of an antitoxin for each and the inoculation of rabbits and guinea pigs, both with the bacillus and its anti-toxin.

A GENERAL INSPECTOR FOR THE NAVY.

Secretary Long desires to secure the authority of congress for the appointment of a general inspector of the navy, whose duties will correspond largely to those of the officers of the army inspector-general's department, and to that end has written a letter to Senator Hale, chairman of the committee on naval affairs, recommending that an amendment be proposed to the naval appropriation bill creating such an office, the incumbent to have the rank, pay and allowances of a lieutenant-commander. The secretary's recommendation is largely the outgrowth of the knowledge that great chances for fraud exist in the present system of expending money for the naval service under general appropriations. It is pointed out that such an officer must be in the permanent establishment, and not a mere civilian employee, as the latter would probably be lenient in reporting on cases where a stricter course would cause antagonism to him personally and jeopardize his chances of retaining his position. Under the general appropriations money may be expended pretty freely on projects authorized by the department, but the department has no sure means of ascertaining whether the work has been done economically or cost all that the reports of expenditures show. A general inspector, familiar with accounts and cost of material and labor, is needed, therefore, it is held, to look after the interests of the government in such matters.

A liberal extension of subscription will be granted to subscribers who will forward to the office of the Marine Review issues of March 2 or Sept. 21, 1899.

THOMAS CLYDE ON THE SHIPPING BILL.

"It is almost ridiculous to dignify such statements by a denial. They are the utmost foolishness."

This is the reply given by Thomas Clyde of the Clyde Steamship Co., New York, when asked regarding the statement in a New York paper that the Hanna-Payne shipping bill was, in its present form, of benefit almost solely to the Rockefellers, who are said to be interested in the American Line; James J. Hill, who proposes to start a line between the Pacific coast and the Orient; the Pacific Mail Steamship Co. and the Ward Line. The statement, pointing out the differences between the original bill and that reported by the senate committee, alleged that the change in the speed limit necessary to secure the benefit of the subsidy from 12 to 14 knots, was made solely for the Great Northern Transpacific Line and a few other interests, and that the change reducing the necessary percentage to be owned by American citizens from 80 to 50 per cent. was made for the benefit of British stockholders in vessels owned principally by Americans.

"Such statements are absurd," said Mr. Clyde. "In the first place, the change in the speed limit is a good one. The great majority of tramp steamships have a speed of about 10 knots. Now, it requires about twice the power to make a steamship go 12 knots that it does to run one at 10 knots, and it was to encourage the building of a class of vessels slightly better than the average tramps, and still not as costly as a steamship of 14 knots, that the change was made. A 14-knot steamship requires many more times the power of one of 10 knots, and about double that of one of 12. The change was made for no one man nor clique of men, and any one who knows anything whatever about the bill knows it. It was made solely to induce the building of a better grade of vessels. In regard to the second statement, that is even more absurd. British owners will not gain one cent because of the subsidy. It is necessary, under the bill, that the vessel shall be owned by Americans before it can receive the benefits of the bill. That being the case where are the British owners coming in? The change means simply that those foreign ships, of which 51 per cent. is owned here, can get the benefit of the subsidy if the other 49 per cent. be purchased by Americans."

EXPLODING SHELL INSTEAD OF SEARCHLIGHT.

Experiments have been recently conducted at the naval proving station at Indian Head with an invention designed to do away with the necessity of using the searchlight on shipboard on occasions when it is desired to "pick up" objects within a limited distance and yet conceal the ship's identical position from an enemy. The invention consists of a shell filled with gas. When the shell explodes it illuminates a considerable area. Its one weak point is that so far no shell has been found with walls sufficiently heavy to stand the shock of explosion required to project it more than a mile or two. Four and 6-inch rifles have so far been used in the trials and the best results secured have been with a shell that explodes and sets the fuses burning when one mile distant from the ship.

Lieut. Strauss, who has charge of the station, has made some very successful trials with the invention recently and is encouraged to believe that if a shell can be made which will stand the shock of exit from the rifle and at the same time will explode at the proper time, a light can be produced that will answer many purposes of the searchlight and have the advantage of not disclosing the precise locality of the vessel firing the torch. Its usefulness would be apparent in a closed harbor, where it might not be advisable to use a searchlight at all times. After the tests have been concluded at Indian Head, several specially made projectiles, filled with the new invention, will be sent to some of the ships with a request that they continue the trials when practicable. It is believed that a shell can be manufactured capable of discharging the explosives at a distance of at least five miles.

MONTHLY SUMMARY OF NAVAL CONSTRUCTION.

Admiral Hichborn's latest report notes that none of the Denver class of cruisers have as yet been laid down and shows the progress of construction of the warships to be as follows:

Battleships—Kearsarge, Newport News works, 99 per cent. completed; Kentucky, Newport News works, 98; Illinois, Newport News works, 75; Alabama, Cramp & Sons, 93; Wisconsin, Union Iron Works, 88; Maine, Cramp & Sons, 22; Missouri, Newport News works, 1; Ohio, Union Iron works, 15.

Monitors—Arkansas, Newport News works, 19 per cent.; Connecticut, Bath Iron Works, 41; Florida, Lewis Nixon, 25; Wyoming, Union Iron Works, 43.

Torpedo boat destroyers—Bainbridge, Neafie & Levy, 45 per cent.; Barry, Neafie & Levy, 45; Chauncey, Neafie & Levy, 45; Dale, Wm. R. Trigg Co., 64; Decatur, Wm. R. Trigg Co., 63; Hopkins, Harlan & Hollingsworth, 37; Hull, Harlan & Hollingsworth, 36; Lawrence, Fore River Engine Co., 85; Macdonough, Fore River Engine Co., 83; Paul Jones, Union Iron Works, 70; Perry, Union Iron Works, 70; Preble, Union Iron Works, 70; Stewart, Gas Engine & Power Co., 15; Truxtun, Maryland Steel Co., 9; Whipple, Maryland Steel Co., 9; Worden, Maryland Steel Co., 9.

Torpedo boats—Stringham, Harlan & Hollingsworth, 96 per cent.; Goldsborough, Wolff & Zwicker, 98; Bailey, Gas Engine & Power Co., 80; Bagley, Bath Iron Works, 15; Barney, Bath Iron Works, 15; Biddle, Bath Iron Works, 5; Blakely, Geo. Lawley & Son, 77; DeLong, Geo. Lawley & Son, 77; Nicholson, Lewis Nixon, 46; O'Brien, Lewis Nixon, 46; Shubrick, Wm. R. Trigg Co., 76; Stockton, Wm. R. Trigg Co., 84; Thornton, Wm. R. Trigg Co., 76; Tingey, Columbian Iron Works, 43; Wilkes, Gas Engine & Power Co., 35.

Submarine torpedo boat—Plunger, Columbian Iron Works, 85 per cent.

UNITED STATES NAVAL PROGRAM FOR 1900.

The house committee on naval affairs has finally reached a definite conclusion on the naval program which is to be as follows:

Two sea-going coast line battleships, of about 13,500 tons each, to cost approximately $3,000,000 each; three armored cruisers of the highest practical speed and most powerful armor and armament, to cost approximately $4,000,000 each; three protected cruisers to cost about $1,141,000 each.

It was determined not to provide any gunboats, in view of the fact that Gen. Otis' recent purchases of serviceable gunboats meets present gunboat requirements.

The committee decided to authorize the secretary of the navy to contract for armor at a price not exceeding $545 a ton. This applies specifically to the armor for the battleships now under construction—the Maine, Missouri and Ohio, about 7,400 tons—but it is understood that its provisions will be extended to vessels authorized last year and those contemplated in the present bill.

On the question of sheathing ships, which has excited much interest in naval circles of late, the committee agreed upon a provision leaving the matter of sheathing to the discretion of the secretary of the navy.

The sum of $12,000,000 is appropriated to continue the construction of ships already authorized, with $250,000 additional for equipment.

Two new dry docks are authorized, one at the Brooklyn navy yard and one at the Norfolk navy yard, costing $1,200,000 each, capable of receiving the largest battleships.

A building for cadets' quarters at Annapolis, costing $2,500,000, is provided for, and over $600,000 is allowed for continuing the work of rebuilding the naval academy.

No action is recommended upon the subject of building ships in government yards.

AN OLD-TIME STEAMBOAT.

The best vessels of early steamboat days on the great lakes were built on Lake Ontario, and it is certainly surprising to note now the power and speed of some of the side-wheelers that were engaged as far back as sixty years ago for the Lake Ontario-St. Lawrence river trade. From an old newspaper clipping it is learned that the steamer United States was built in Ogdensburg in 1831 by a company formed for that purpose and known as the St. Lawrence Steamboat Co., and was launched Nov. 17, 1831. This steamer was 150 feet long on deck, 26 feet beam, 10 feet depth of hold, and measured about 450 tons. She had two beam engines, 40 inches diameter and 8 feet stroke. Wheels were 18 feet diameter, 9 feet face of bucket; draught of water 8 feet. She had two boilers on deck—one on each side of her guard forward of the wheel. Her speed was 10 to 12 miles an hour. Consumption of fuel (wood) was about 130 cords each trip from Ogdensburg to Lewiston and return. William Capes of New York was the ship carpenter and William Avery of Syracuse built her engines. Capt. Elias Trowbridge of Oswego was her first commander and Capt. Bates from the Canada side was her sailing master.

Among the changes that have recently taken place in the Bath Iron Works, Bath, Me., are the following: Chas. R. Hanscom resigned as general superintendent and John S. Hyde appointed in his place; Wm. C. Besselievre resigned as assistant superintendent and Chas. P. Wetherbee appointed to his position; William A. Fairburn resigned as chief draftsman and Fred C. Cook appointed to succeed him; Wm. K. Stiles resigned as foreman of ship yard, Hugh T. Madden assumes the position; Scott Hanscom resigned as superintendent of torpedo boats, but as yet no one chosen to fill the vacancy; Geo. Richardson, in charge of work on monitor, resigned, and Thomas Fairburn now in charge of that work; Enoch Reed, master rigger, resigned and hereafter rigging and caulking of vessels will be let out on contract.

SHEATHING OF SHIPS.

A SUBJECT OF FIRST IMPORTANCE IN THE NAVY—CONGRESSIONAL COMMITTEE TURNS THE ENTIRE MATTER OVER TO THE SECRETARY OF THE NAVY—A STRONG FIGHT FROM THE CHIEF CONSTRUCTOR.

During the past few weeks the question of sheathing or not sheathing the new battleships and armored cruisers of the United States navy has been thoroughly debated by the naval board of construction. The original recommendation of the board was that they should be sheathed and congress so provided in the act authorizing their construction. The majority of the board, however, changed its mind and has been arguing the question ever since with the chief constructor. The house naval committee, unwilling or unable to decide the merit of the controversy, has placed the entire subject at the discretion of the secretary of the navy. Meanwhile the literature of sheathing has been much enriched. Among the correspondence submitted to the naval committee is another lengthy report from Chief Constructor Hichborn, who is fighting single-handed for the sheathing of new ships. He says:

"The board of construction recommended to the secretary of the navy on Jan. 19, 1900, that he should advise congress to so amend the act authorizing the construction of three battleships and three armored cruisers that 'to be sheathed and coppered' be stricken from said act. In my minority report, as member of said board on this recommendation, I asserted 'that the fouling of the copper bottom is practically nil, and that the copper bottom battleship will maintain its speed on the same consumption of coal, provided that the initial efficiency of the boilers and engines is maintained.' This does not mean that a copper bottom will never grow foul, for no substance is known that will not attract marine growths if immersed in sea water long enough, but while 'long enough' for a steel or iron bottom is from two to six months, for copper bottoms it is from three to four years. This property in copper which preserves it from fouling is due to two causes: First, to a salt of copper which is formed chemically and which is poisonous to most marine growths; and, second, to the exfoliation of the surface under the action of sea water, which carries away any marine growths which may have obtained a lodgment. Sir William H. White, in a paper on 'Wood and Copper Sheathing for Steel Ships,' read before the Institution of Naval Architects in 1896, says, in speaking of the Inconstant:

" 'This ship has now been afloat for twenty-seven years and has performed much trying service under sail and steam. Her sheathing has never given serious trouble and the antifouling properties of her copper bottom have been well secured. Even copper-sheathed vessels may, and do, become foul after long periods afloat, and under certain circumstances I have seen instances in which extraordinary fouling has occurred. On the contrary, copper bottoms usually keep fairly clean for a considerable time, and I have seen copper-sheathed vessels docked after one and a half to two years' service, chiefly in hot climates, with practically clean bottoms. Careful observations made in the royal navy, on ships employed in European waters, have shown that after five or six months afloat about 20 to 25 per cent more power is required to maintain ordinary cruising speeds than sufficed with clean bottoms; after ten to twelve months afloat this increase of power became 40 to 50 per cent. The ships on which these figures are based were not considered exceptionally foul when docked.'

"The docking of a heavy ship, especially of a battleship with its enormous localized weights which can not be removed, must always remain an operation involving more or less risk, and all possible means of lessening the frequency with which docking is required should be taken. It is established that painted steel bottoms need to be cleaned and repainted at least twice a year and in exceptional circumstances much oftener, while a copper sheathed bottom will probably go through a three years' cruise without needing to be docked more than once at the most. Docking, especially in foreign private docks, is an expensive operation, and instances have been known of as much as $15,000 being paid for simply docking and painting a battleship. The Indiana was docked at Halifax in August, 1897, remaining in dock four days, and all the work of cleaning and painting was done by the crew, but the bill was $3,492.02. The cost of docking and painting this ship twice in the New York navy yard was $9,344.18, and no lay days or profits had to be paid. A comparison of the cost of maintenance, disregarding increased coal consumption, may be made between the Bancroft, unsheathed, of 900 tons, and the Marietta, composite, of 1,000 tons. The former has cost for docking, cleaning and painting, exclusive of repairs, since April 20, 1897, $4,014.01, and for two years has rendered no service, being in ordinary. The latter has been docked twice in the same period, at a cost including repairs to the bottom, of $903.28. The sheathing of the Marietta cost $17,000, and at this rate this amount should be saved in twelve years on the cost of docking alone. While the initial purpose for which sheathing is applied is to keep the bottom clean, there can be no doubt that it does add materially to the strength of the bottom in such a manner that it cannot be compensated for by increased thickness of the steel bottom as suggested by the majority of the board on construction. The wood acts as a cushion and distributes the force of impact over a large area, and no increased thickness of plating could do this. So well is this recognized that it has become the practice in the British navy to reduce the thickness of steel skins one-sixteenth of an inch below that required for ships of the same class unsheathed.

"Regarding the cost of sheathing, the majority of the board on construction attempts to make an estimate which is grossly exaggerated. 'One of the principal ship building firms in the country' is given as authority for the statement that sheathing would probably add 7½ per cent. to the cost of hull and machinery. As a matter of fact this was the proportionate cost of sheathing the Marietta, a composite gunboat of 1,000 tons displacement. But if anything but the bare hull is to be considered in percentages, it should be the completed vessel, and on this basis, and allowing for the extra cost if the Marietta had been plated and sheathed instead of composite, the cost was 5.59 per cent. of the cost of the completed ship. The cost of sheathing the Chesapeake was 4.65 per cent. of the cost of the completed ship. Now, in applying these percentages to vessels of from twelve to fourteen times their displacement, any practical man should see at once that the wetted surface of the ships, on which the cost of sheathing depends, does not increase in direct ratio to the displacement, and that, therefore, the proportionate cost will be very much less. The surface covered in the Marietta is about 7,070 square feet, and if it is increased directly as the displacement it would be for the battleships 95,445 square feet, and for the armored cruisers 88,375 square feet, while the actual surfaces to be covered are respectively 40,289 and 36,435 square feet. The estimated cost of sheathing for the battleships is $141,512, or 2.375 per cent. of the cost of the completed ship, and for the armored cruisers $128,880, or 2.014 per cent. of the cost of the completed ship. The estimated cost of sheathing for all six ships is $811,176, instead of $1,569,000, as estimated by the majority of the board; about one-half, or a difference of $757,824. The average cost of each of them will be $133,183, and this amount will be mostly saved during their first cruises on the cost of docking, cleaning and coal, to say nothing of the increased efficiency of the ships. In a paper on the cost of warships, read by Francis Elgar, Esq., late director of Her Majesty's dock yards, before the Institution of Naval Architects, in 1896, the tabulated cost of sheathed and unsheathed ships of the Royal Arthur class of first-class protected cruisers is given, both for dockyard and contract construction. Nine of these ships were built in 1891-92, and four of them are sheathed. The average cost of hull and fittings of two sheathed exceed that of two unsheathed ships built in dockyards by $35,850, or 1.87 per cent. of their average total cost. For contract-built ships the average excess was $27,750, or 1.53 per cent. of the average total cost. The ships are of 7,700 tons displacement, and there must be differences in design, for Professor Elgar gives the cost of sheathing complete as $82,280, this being 4.3 per cent. of the total cost of the sheathed ship ready for sea.

"Admiral Sampson's argument is practically identical with many of those made thirty years ago, when experiments with sheathing applied to iron vessels were commenced. He says, for instance, that in his opinion the practice of sheathing is still in an experimental stage. So far is this from the facts that so long ago as Dec. 16, 1891, the British admiralty, after twenty-three years of exhaustive experimenting, the results of which are in the possession of the bureau, with various forms of sheathing, appointed a committee to completely study the subject, collate the results of experience, and formulate definite instructions for future work. This committee finally prepared a standard specification, going very minutely into detail, designated 'instructions for working wood sheathing on ships,' which has since been used. The bureau is well informed as to the report of this committee, and the specifications for sheathing the Chesapeake were based upon it. They (the British) have built or are building since that time forty-seven armored ships, of which nine, or 19 per cent., are sheathed, and seventy-five cruisers, exclusive of torpedo gunboats, of which fifty, or 67 per cent., are sheathed. Without exception all the first-class armored cruisers laid down since 1892 have been sheathed. These are the Powerful and Terrible, of 14,200 tons; the Andromeda, Argonaut, Ariadne, Amphitrite, Diadem, Europa, Niobe and Spartiate, of 11,000 tons, and the Crescent, Gibraltar, Royal Arthur and St. George, of 7,700 tons. Of the armored ships sheathed only three—the Renown, Barflour and Centurian—are officially designated as battleships, but the six first-class armored cruisers Aboukir, Cressy, Hogue, Sutlej, Euryalus and Bacchante, of 12,000 tons, which are sheathed, all have side armor belts, and so far as sheathing is concerned are identical with battleships.

"While it is true that we have as actual experience in our navy only the six gunboats of the Annapolis class and the Chesapeake, the results of the English experiments are just as valuable to us as if we had made them. We have, however, in the service of our government one vessel which is an excellent example. The fish commission steamer Fish Hawk was built by Pusey & Jones, at Wilmington, in 1879. Her hull below the main deck is of iron, in accordance with Lloyd's rules, and sheathed with a single course of yellow pine 2½ inches thick, and coppered, the sheathing being fastened to the skin plating by ordinary iron carriage bolts, with pine plugs over their heads. After twenty years of continuous service, during which she has had no extensive repairs, she is still in service and in good condition. No indication of damage from galvanic action has ever been observed. The Fish Hawk is a twin-screw vessel, 146 feet 8 inches long, 27 feet wide and 11 feet 4 inches deep to the top of the iron hull. Her bottom and side plating is only twenty-eight one hundredths of an inch thick, and if galvanic corrosion had existed she would have been destroyed many years ago. Admiral Sampson's suggestion that we should obtain at any reasonable cost the experience of England shows lack of knowledge. This experience has been fully in our possession for years. His assertion, however, that 'the sheathing of this new ship (Chesapeake) is a complete failure, and should now be removed,' is absolutely unjustified by the facts. There has been no serious trouble whatever with the sheathing of the Chesapeake. It was found that a small amount of water had gained access to the small spaces between the inner surface of the plank and the steel skin, and some experiments were undertaken with a view of correcting this, but it has been found by English experience that not only is this condition apparently unavoidable, but it is conclusively proven that such water does no damage to the ship."

The chief constructor here makes extensive extracts from reports of the British admiralty to disprove Admiral Sampson's claims regarding galvanic action. He also makes extensive extracts from the paper already referred to as prepared by Sir William White of the British admiralty in support of sheathing. No living man, he says, is more universally recognized as authority on questions connected with naval architecture than Sir William White. Admiral Sampson's suggestion that experiments be made with some kind of paint is answered by the statement that such experiments have been made at great cost, and that the reward for success in that direction would be beyond computation, but no practical results have been secured. In conclusion, Rear Admiral Hichborn says:

"The fact must not be lost sight of that in determining whether a given ship shall or shall not be sheathed, her probable service must be a decisive factor. The fact that most of the huge battleships of continental navies are unsheathed, simply implies that they are expected to perform most of their service in the comparatively contracted home waters, with dry docks always at hand. We, on the other hand, must be governed, not by what other and differently situated people do, but by existing conditions in our own service. Our coast line is extensive and docking facilities for large ships are extremely scarce and widely scattered, so that even if our battleships are to be kept in the immediate vicinity of our main coast line,

they need something besides our dry docks to keep their bottoms in efficient condition for cruising.

"The majority of the board in its report of Jan. 26, 1900, to which I had no opportunity to reply before it was transmitted to the department, attempts to make the point that I did not, eleven years ago, advocate the sheathing of battleships, by quoting the following lines from an article on 'Sheathed or Unsheathed Ships,' written in 1889: 'Primarily it should be stated that it is not claimed that all vessels should be sheathed, but only those denominated as cruisers.' From this the board draws the following conclusion: 'Hence had the naval committees (in 1899) followed the opinion of the dissenting member as expressed in the pamphlet (1899) with regard to vessels other than cruisers they would not have recommended sheathed battleships.'

"This conclusion is fallacious in the extreme. At the time the article was written (1889) there were no battleships built or in contemplation, except the Maine, designed as an armored cruiser, and the Texas, which, though denominated a second-class battleship at that time, was no more than an armored cruiser. A battleship at that period was a vessel in which speed and coal supply were sacrificed for armor and armament, and were deemed requisite only for coast and harbor defense. It was therefore not essential that vessels of that type should keep the sea for long periods, and for this reason only sheathing was not at that time advocated. During the past ten years great changes have been wrought in ship design by the introduction of face-hardened armor, whereby the thickness and weight of armor carried is materially reduced, by the introduction of smokeless powder and improved ordnance giving greater offensive power in smaller guns, by improvements in machinery and boilers, and by the popular demand for fast ships. All these factors have tended to erase the line of demarcation between cruisers and battleships, so that today the necessity for the maintenance of speed in the battleship is as urgent as it was formerly for the cruiser, and I am as firmly convinced today of the absolute necessity of sheathing and coppering the bottoms of the cruising sea-going battleships as I was twenty years ago that all cruisers should be sheathed and coppered.

"The battleship of today performs exactly the same service as the cruiser, and is expected to make as long voyages and keep the sea for as great a period without docking, and is given an enormous coal supply for this purpose, and a speed which but a few years ago would have been considered sufficient for a cruiser. The sheathing of the armor belt in battleships, while presenting different features from that of the unarmored bottom, makes no mechanical difficulties which cannot be overcome without damaging the defensive qualities of the armor. Several different methods of doing this have been followed in foreign armored ships, of which the bureau is well informed."

WIRELESS TELEGRAPHY ON AN OCEAN LINER.

It was announced in the Review last week that the North German Lloyd Steamship Co. was experimenting with wireless telegraphy on its liners. Following is the report made by Lieut. J. B. Blish, United States navy, to Rear Admiral Bradford, on the recent tests on the Kaiser Wilhelm der Grosse:

"The Kaiser Wilhelm der Grosse, the first merchant steamer to receive a permanent equipment of wireless telegraph, sailed from Bremerhaven Feb. 28, 1900, on her regular trip, touched at Southampton and Cherbourg March 1, and arrived at New York March 7. I visited the ship on March 10 at the company's dock at Hoboken and inspected the wireless telegraph outfit. The apparatus is almost an exact reproduction of those tested by the bureau last fall on the U. S. S. New York, Massachusetts and Porter, and described in the report of the Marconi board. The choking coils and cells of the local battery are enclosed in neat wooden boxes. Various binding posts and fittings are solidly constructed and neatly finished. The connections to the back-stop of the key for automatically connecting up the receiver are substantially made and are used right along. The vertical wire is double; that is, a bight is triced up to the sprit end of and one leg is spliced into the other just before it passes through the top of the deck house. An umbrella-shaped sheet of ebonite protects the tube through which the wire is led into this operating room. An improved form of cylindrical ebonite insulator is used, having a small strand of seizing wire cemented in each end. Two substantial wooden posts secured to the forward corners of the deck house take the strain of the wire which is led midway between them. No wooden topmast is used, the sprit, about 20 feet long, hoisting to the truck of the steel pole mast, giving an effective height of vertical wire of about 100 feet.

"The shore station on the Isle of Borkum, off the mouth of the river Ems, had a vertical wire of 150 feet height. Messages were received on board the ship forty miles from this station and were received at the shore station when the ship was fifty miles away. An outfit had been sent on board the Borkum light-ship, but owing to the heavy weather the wooden topmast had not yet been secured aloft when the Kaiser Wilhelm passed. This light-ship is to have a vertical wire of 130 feet height. The Marconi operator left the ship at Southampton and is to board her there on her return. In the meantime, an operator in the employ of the steamship company is taking care of the apparatus and learning to operate it. The first officer of the Kaiser Wilhelm der Grosse stated that the apparatus had worked without a hitch and communication was not interrupted while the ship was in range of the shore station."

One of the vessels of the Corrigan fleet of Cleveland, the Aurora, was the first steamer on the great lakes to be equipped with a towing machine of the Shaw & Spiegle type, manufactured by the American Ship Windlass Co. of Providence, R. I. Some time later James Corrigan ordered three of these machines to be used in towing his large steam barges. Now that he has acquired a fleet of wooden vessels of 1000 to 2500 tons capacity, all to be operated in tows, Mr. Corrigan is satisfied that the smaller type of steam towing machines can be used to great advantage on the small vessels as well as on the big ones, and he has ordered five more machines, one No. 3, one No. 2 and three of the No. 1 kind.

President Loubet of France, has consented to be present at the launch of the Transatlantique Co.'s new liner Savoie at St. Nazaire, March 31. The Savoie will be the largest steamer ever built in a French yard, and is intended for American service.

ALONG THE ATLANTIC COAST.

PROGRESS OF CONSTRUCTION IN THE SHIP YARDS ALONG THE SEABOARD—LAUNCHES, VESSELS BUILDING AND IN CONTEMPLATION.

Aside from the Bath Iron Works, which has a very large amount of work to do on steel vessels, Percy & Small of Bath, Me., are laying the keel for a six-masted schooner; Kelley, Spear & Co. have a four-masted schooner and several barges under contract, and the New England Co. about the same amount of tonnage, while Arthur Sewall & Co. will construct several big steel sailing ships. At Thomaston, Dunn & Elliott have contracts for three schooners, and at Waldoboro George L. Welt is building a five-masted schooner, with a contract about to be signed for another vessel of the same type. Cobb, Butler & Co. of Rockland have launched a three-masted schooner of 496 tons and are now at work on a four-master of 775 tons, while I. L. Snow & Co. at the same port will build a three-master. H. M. Bean of Camden has a four-master on the stocks, and is preparing the ways for a six-master of 2750 tons and a five-master of over 2000 tons. At Belfast George A. Gilchrist and E. A. Carter will each build a three-master, and at Bucksport McKay & Dix of New York will build three vessels for the Greenland trade, each of about 1,200 tons.

At the ship yard of Wolf & Zwicker, Portland, Ore., the amount of new work and repairs under way is larger than at any time in the history of the concern. In the various smaller yards of Portland all the men that can be secured for work on new vessels are employed. Carpenters in the employ of the Oregon Railway & Navigation Co. are hurrying to completion a towboat, the Harvest Queen, which will be quite a powerful vessel, used entirely for towing. At the Supple Ship Yard the steamer Reliance for the Dalles, Portland & Astoria Navigation Co. is about ready to receive machinery. A towboat was launched at this yard only a few days ago and another contract to build the hull for a sea-going vessel has just been secured. At the Johnson ship yard two stern-wheel hulls are being built and work will be commenced shortly on a fishing tug. At the Paquet yard above the city levee on the west side keels will be laid shortly for two new boats for the Paul Mohr Transportation Co.

The Maine ship yards are hives of industry. Following is the list of wooden vessels which have been launched so far this year: Five-masted schooner Mary W. Bowen by New England Co., Bath, 1907 tons net; four-masted schooner Marie Palmer by Wm. Rogers, Bath, 1594 tons net; three-masted schooner Henry Weiler by H. S. Bowke, Phippsburg, 375 tons net; barge Iowa, New England Co., Bath, about 1500 tons net; barge Elk Garden, Kelley, Spear & Co., Bath, 749 tons net; tug N. Y., N. H. & H. R. R. No. 13, Bath Iron Works, about 137 tons net; tug N. Y., N. H. & H. R. R. No. 14, Bath Iron Works, about 137 tons net; barge, New England Co., Bath, 800 tons net; five-masted schooner Helen W. Martin, Percy & Small, Bath, 2020 tons net; three-masted schooner Wellfleet, Cobb, Butler & Co., Rockland, 496 tons net. The totals are five schooners, three barges, two tugs, ten vessels, aggregating about 9715 tons.

It is expected now that the submarine boat Plunger will be ready for a trial about Oct. 1. The William R. Trigg Co. of Richmond, Va., will substitute gas engines for the triple expansion steam engines that were to have been used for surface motive power. The propelling power while submerged will be, as in the case of the Holland, electricity. Mr. Frederic A. Verdu, engineering expert for the Holland Torpedo Boat Co., will superintend the changes.

A preliminary trial trip was given the United States torpedo boat Stringham last week by the builders, the Harlan & Hollingsworth Co. of Wilmington, Del. Four boilers were tested and satisfaction was expressed with the performance. The official trial trip will take place on the Chesapeake, but the date has not yet been definitely fixed. The boat is required to make 30 knots.

Work on buildings of the New York Ship Building Co. at Camden, N. J., is progressing rapidly and the only delays now anticipated are those in the delivery of structural steel. As a number of ships have been offered, the company will, when the works are completed, begin operations with the berths full.

Capt. Fields Pendleton has bought the interest of H. H. Carter in the buildings, materials and tools in the Carter ship yard at Belfast, Me., and it is now owned jointly by him and E. S. Carter. A three-masted schooner will be built at the yard.

Colyer Bros., 10 Burling slip, New York, are having a 500-ton barge built at Thos. S. Marvel & Co.'s yard, Newburgh, N. Y. Her length is 120 feet, moulded beam 32 feet, and 8-foot hold. She will be launched in May next.

The American Shipmasters' Association of New York has received an order from the International Navigation Co. to survey the six steamships, now being built at the Cramp works, Philadelphia, and in Glasgow, Scotland.

The William R. Trigg Co. of Richmond, Va., is having estimates made for a dry dock of the following dimensions which they intend to construct: Length, 500 feet; breadth, 150 feet; draught, 25 feet over sill.

Bids will be opened by the navy department on March 27 for furnishing the Washington navy yard with tools, belting, asbestos board, corrugated sheet iron, brass rod and a locomotive steam crane.

Mr. E. J. Tull of Pocomoke City, Md., has contracted to build for Messrs. Dix & Wilkens of Baltimore a three-masted schooner to be 107 feet long, 28 feet beam and 9¼ feet depth of hold.

The Harlan & Hollingsworth Co., Wilmington, Del., is to build a steam yacht 212 feet long over all, with twin screws, for William Fletcher of Providence, R. I.

Work is progressing favorably on the three new steamships now under construction at the Roach Ship Yard for the American-Hawaiian Steamship Co.

The Nickel Plate road offers to the traveling public a great convenience by the sale of the Central Passenger Association mileage ticket, which, besides the Nickel Plate, is honored for passage on thirty-six other roads. Apply to any agent. 48, Apr. 5.

GREAT DAM ON THE NILE.

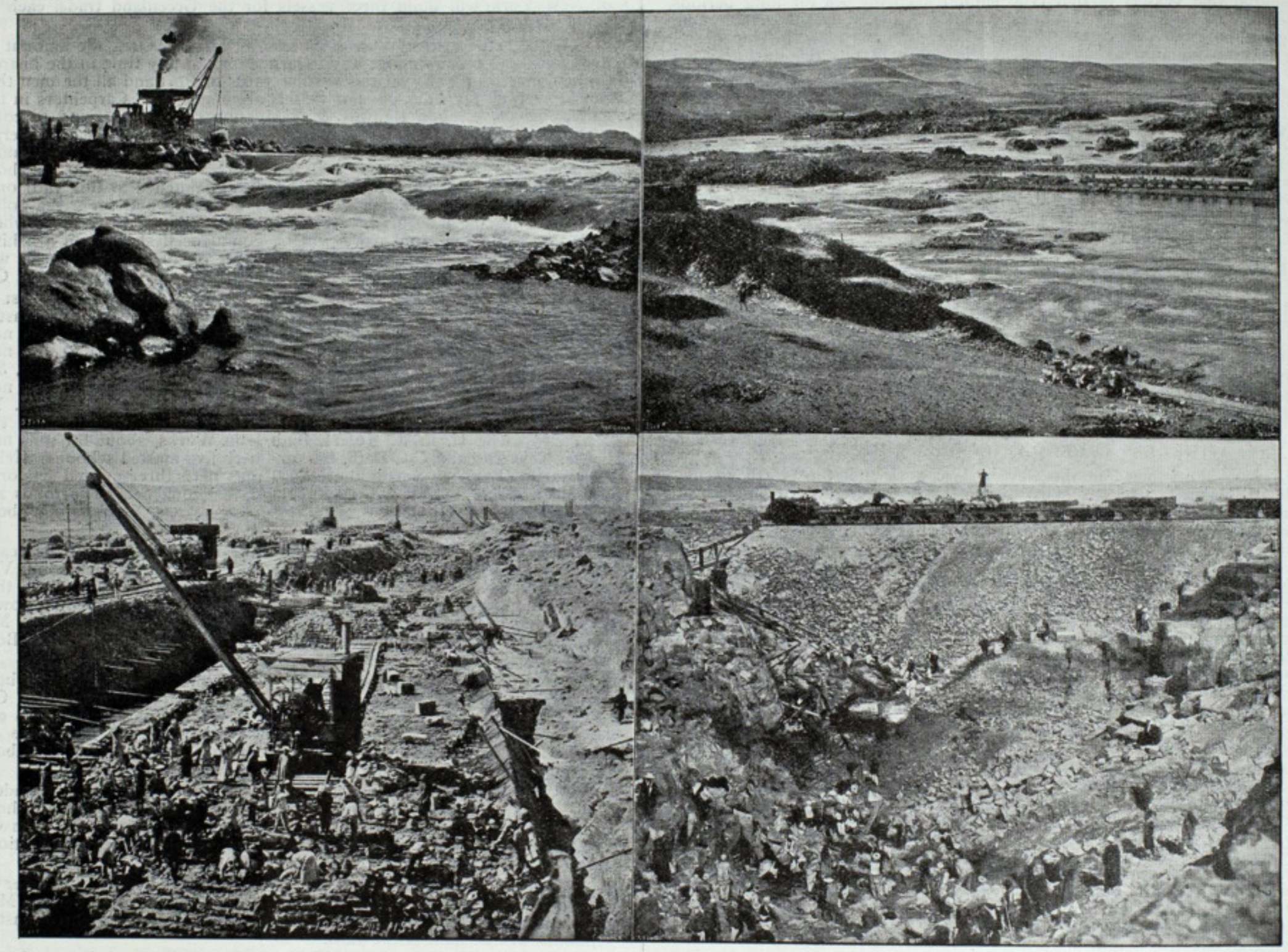
MORE THAN A MILE LONG AND FOUNDED ON GRANITE ROCK—A WIDTH OF 80 FEET AT BOTTOM AND 23 FEET AT TOP—PART OF AN IMMENSE IRRIGATION PROJECT.

In his book on "Egyptian Irrigation," reviewed in Engineering of London, Mr. W. Willcocks, an eminent English engineer, says that the area of Egypt is 6,250,000 acres. Of this, 4,130,000 acres produce a rental of 20 millions sterling; while the remaining 2,120,000 acres produce a rental under 2 millions sterling. Practically one-third of Egypt is totally undeveloped for want of water. It is to rescue some of this land, and also to render more certain the perennial irrigation of other portions, that the great dam on the Nile at Assouan is now being built. The original plan contemplated flooding the Temple of Philæ for several months each year, and met with such violent opposition from archæologists and others that the government was obliged to give way and reduce the water surface from a height of 114 metres above datum to 106 metres. Whether this will ultimately save the temple remains to be seen, but it greatly reduces the storage capacity, which now stands at 1,065,000,000 cubic metres, the length of the reservoir being 111 miles. The dam is to be a single straight masonry wall, pierced with 140 under sluices of 14 square metres (107.6 square feet) area each, and by 40 upper sluices of 7 square metres each. The total area of opening will be 1960 square metres (21,097 square feet) for the under sluices and 280 square metres for the upper sluices, or 2240 square metres (24,111 square feet) in all. The dam will have a total length of 1950 metres (1.21 miles) on a perfectly straight line, and will be founded everywhere on granite rock. The maximum head of water will be 20 metres (65 ft. 7 in.) and the maximum height of water 28 metres (91 ft. 10 in.). The width of the dam at the top will be 7 metres (23 ft.), and at the bottom 24.5 metres (80 ft. 4 in.). During the whole of the Nile flood all the sluices will be fully open, and the water will be discharged through them. The maximum discharge of an ordinary flood is 14,000 cubic metres (494,400 cubic feet) per second, and this will traverse the sluices of the dam with a velocity of 6.25 metres (20 ft. 6 in.) per second, and a head of 3 metres (11 ft.).

The site of the dam is just below the Assouan cataract, some 500 miles south of Cairo, this being the only spot at which it was believed that good foundations could be obtained. The bed of the Nile is here filled with islands, which are separated from each other and from the banks by channels, through which the water rushes furiously, especially at low Nile. At high Nile, of course, the gradient is flatter, and the islands are more or less submerged. It is at this time that navigation of the cataracts can be attempted with relative ease. Starting from the east, or right hand, the channels are met in the following o der: The East channel, the Termooseyah channel, the Bab-el-Kebir, the Bab-el-Haroun, the Bab-el-Sogair, the central channel, and the west channel. The highest known flood level on this spot reached the level of 99.78 metres. At low Nile there is water in five channels only, the east and the Termooseyah channels being dry. A great deal of work has also been done on the islands between Bab-el-Sogair and the central channel and between the central channel and the west channel. Masonry has also been put in for a navigation channel, with four locks, on the west side.

The difficult problem which faced the contractors was putting in the foundations in the five low-water channels. It must be remembered that these are just below the cataracts and that the water rushes through them with enormous velocity, and that it was quite impossible to predict what their bottoms would be like. The accompanying views will enable the reader to form some idea of the difficulty of closing and emptying such waterways. The same general method has been adopted in each case, and now four channels out of five have been closed, the west being the only one open. At the lower, or north, side of the site of the dam a bank, locally known as a "sudd," of rock was constructed across the channel. This was a work of great expense and difficulty, as the current was capable of taking a four-ton block of stone and carrying it along as if it had been a football. Nevertheless, progress was gradually made, and the sudd grew out from the river bank into the channel. Occasionally a part of it would be swept away, with the railway and steam crane upon it, and the work had to be done over again. In the case of the sudds in Bab-el-Kebir and Bab-el-Haroun, rails and bar iron were used to tie the embankment together. Of course, such a loose rubble dam was not watertight, but it secured a reach of quiet water above it, in place of the wild rapid that had previously been there. The next step was to make a tight bank above the site of the dam. This was done by means of bags of sand, the quantities used being enormous, as will be seen later. The lower bank was then made tight by sandbags and sand, and then the question remained to be settled whether the bottom was tight. The general appearance of the rocks was by no means reassurring on this point. It was perfectly possible that there might be fissures in direct communication with the river above, which would supply water faster than any pumping plant would deal with it. If that had been so it would have become necessary to put in the foundations under compressed air, a work of great difficulty and immense expense. Fortunately nature was kinder to the engineers than she often is, and the powerful pumps which had been provided proved to be unnecessary. Four channels were pumped out in succession, and are now practically dry, and only one is left in doubt.

These operations are illustrated in the accompanying half-tone illus-



The Great Dam on the Nile at Assouan. (ILLUSTRATIONS FROM ENGINEERING.)

PHOTOGRAPHS SHOWING THE PROGRESS OF CONSTRUCTION AND THE RUSH OF WATERS WITH WHICH THE ENGINEERS HAVE HAD TO CONTEND.

trations. The contractors have now several months before them in which to get in the foundations in these channels, before they are driven away by the floods, and may be expected to make the best use of their time. When the flood comes they will, necessarily, have to suspend many of their operations, as a great part of the work will be submerged. Probably several of the sluices will be got in ready to pass the low Nile of next winter.

The contract between the Egyptian government and Messrs. John Aird & Co. was made in 1898. The preliminary works were begun in April of the same year, and were principally confined to excavation on the line of the dam and of the navigation channel, and to bringing onto the ground plant and materials. Houses, shops, restaurants and hospitals were also built to accommodate the large number of persons directly and indirectly connected with the works. During the early summer of 1899 the number of these persons reached a total of 10,000. The foundation stone of the dam was laid on Feb. 12, 1899, by the Duke of Connaught. Masonry was commenced on March 16, but very little was done before the beginning of the following month. During May, June and July, 1899, masonry was energetically carried on at the east bank, and during the three months 40,035 cubic metres were laid, the maximum for one month, that of July, being 16,094 cubic metres. Owing to the Nile flood, less progress was made with masonry during the remaining five months of the year, and on Dec. 31 the total stood at 74,703 cubic metres.

The navigation channel is practically down to the reduced level of 90 metres for 525 metres south of the axis of the dam. Work is being rapidly pushed forward in the lock channel. In the first lock the excavation is being carried down deeper than expected, as the bottom is soft. The second lock is down to the full depth in several places, and offers a good foundation. The rock in the third lock is satisfactory. In the fifth recess excavation has been commenced,.and about 600 cubic metres taken out. North of the axis of the dam work has been carried on since November, as the level of the water permitted it to be got at. During the months of September, October, and November, 1899, 20,000 cubic metres of sand were brought by rail and deposited on the bank of the Nile, near Massid, in a position convenient for filling the bags and loading the boats which conveyed the material to the site of the sudds, south of the dam. On Dec. 8, the first bags were deposited in the Bab-el-Kebir, and on the 28th the rocks separating Bab-el-Haroun from Bab-el-Kebir were reached. A cross sudd, north and south along those rocks was completed on Dec. 12. To the end of January 470,086 bags of sand and clay, and 15,600 cubic metres of loose material, chiefly sand, had been used in the sudds, and 31,600 bags of sand were removed from the cross sudd into the main sudd. In the north sudd of the central channel, 8,400 cubic metres of stone in large blocks, and 2,300 cubic metres of small stone were used. The water level immediately south of the sand sudd rose gradually, as the main sudd was built from reduced level 92.19 metres on Nov. 30 to 92.56 metres on Dec. 12. At the same time, the gauge on Philæ showed a fall of 5 centimetres. In this instance the sand sudd was completed before the stone sudd. To the north of the stone sudd in Bab-el-Kebir on Nov. 30 the water level was 89.4 metres; on Dec. 7, when the stone sudd on Bab-el-Haroun was practically closed, it was 88.84 metres; and on Dec. 12, when the cross sudd was complete, it was 87.95 metres. The water level between the sudds sank gradually as the channel was narrowed by sandbags; on Dec. 12 the level south of the bag sudd was 92.56 metres; between the sudds, 88.02 metres; and north of the stone sudd, 87.92 metres. At the same time the water in the west channel stood at 89.62 metres.

The sandbag sudd reached the west side of Bab-el-Sogair on Jan. 3, and then the water fell in Bab-el-Sogair and Bab-el-Haroun to the same level as that in Bab-el-Kebir. The pumps were started on Jan. 9, and in a short time the water was removed; since then one pump has usually been sufficient to keep the water down. Excavation was commenced on Nov. 13, on the east side of Bab-el-Kebir, and on the island between that and Bab-el-Haroun. The present state of affairs can be learned from the accompanying views.

Naturally it will be a considerable time before such an important work can be completed and come into operation. When storage commences, the effects on Egypt will be immediate and great, although the country could well do with a much greater quantity of water than the reservoir will provide. The final designs and specifications were drawn up in accordance with the decision of Sir William Garstin, K. C. M. G., the under-secretary of state for public works, Mr. W. J. Wilson being the chief engineer, and in consultation with Sir Benjamin Baker, K. C. M. G., F. R. S., who was appointed consulting engineer to the works by the Egyptian government. Messrs. John Aird & Co. of London are the contractors, with Mr. John Blue as chief agent, and Mr. Maurice Fitz-Maurice as resident engineer.

CHECK TO BRITISH SHIP BUILDING.

"There is no doubt about it, though as yet there is no appearance of it in the yards, which still resound with the hum of industry," says the London Statist. "Nor will there be any outward sign of it for many months to come, because the yards have as much business left over from last year as will keep them actively employed for the most of this year. But the stream of orders has stopped and we hear from the great building centers in the north that no new contracts of any moment are even in the region of negotiation. When, on Dec. 30 last, reviewing the ship building work of the year, we said that the great advance in the cost of production, owing to the rise in iron, steel and coal, had had the natural effect of keeping buyers back, but that at the close of the year there was no prospect of cheaper material, whereas there was a prospect of imperative demands for new tonnage. There is still no immediate prospect of cheaper material, but the demand for new tonnage has ceased altogether, in spite of the great withdrawal of vessels from ordinary avocations for employment in connection with the war. Of course steamers must be built for some purposes, whatever the cost may be, but even of that sort operations will be kept at a minimum, for while there is no present prospect of coal and material coming down, there is a pretty general feeling that prices have about reached top, and therefore there is a disposition, whether justifiable or not we will consider on another occasion, to look for the turn of the tide."

IMPORTANT DEPARTURE IN THE NAVY.

Secretary Long has just issued an order creating a board of officers with Admiral Dewey at the head, corresponding to the general staff of continental navies. The order has created a great deal of discussion in naval circles where it is regarded as one of the most important departures ever undertaken by the navy department. The board will constitute a permanent strategy committee, whose duties generally will be to keep the navy up to a high degree of efficiency in preparation for a war, to arrange plans for the operation of American fleets and for home defence, and to give advice to the government when hostilities are in progress as to the methods of strategy to be employed by the navy.

"The order," said Secretary Long, "is the result of several years of study by Capt. Taylor and he has been engaged recently in this work at the naval war college. The board, which will correspond to the general staff of foreign navies, will be kept in close touch with the naval war college, which prepares plans for war, and the naval intelligence office, which gathers information for the navy. It is on that account that the president of the war college and his assistant, and the chief intelligence officer and his assistant, will be members. In time of war it will be a strategic board." The order reads as follows:

"General Order No. 544—A general board is hereby established to be composed of the following officers: The admiral of the navy, the chief of the bureau of navigation, the chief intelligence officer and his principal assistant, the president of the naval war college and his principal assistant and three other officers of or above the grade of lieutenant-commander. Should the principal assistant of the chief intelligence officer, or the principal assistant of the president of the naval war college be below the rank of lieutenant-commander, an officer or officers of the grade of lieutenant-commander or above will be designated to fill such place or places on the board. The purpose of the department in establishing this board is to insure efficient preparation of the fleet in case of war and for the naval defence of the coast. The chief of the bureau of navigation will be the custodian of the plans of campaign and war preparations. He will indicate to the war college and intelligence office the information required from them by the general board, and in the absence of the admiral of the navy he will preside at the meeting of the board and exercise the functions of president of the board. The board will meet at least once a month, five of its members constituting a quorum, and two of its sessions every year shall extend over a period of not less than one week each, during which time the board shall meet daily."

Much criticism is already manifest to the order in the navy department. Some of the officials fear that the board may assume to dictate what character of ships shall be built and the manner in which they shall be constructed and fitted out. Another objection pointed out is that there is no provision in the order which will permit the appointment of a staff officer on the board.

NAVAL AFFAIRS.

Rear Admiral Hichborn, chief of the bureau of construction and repair, recently celebrated his sixty-first birthday. Floral tributes were presented to him by the draftsmen in his office and also by the clerks of the construction bureau. Admiral Hichborn's career has covered the various stages of ship building—from wood to iron and from iron to steel; and from sail to steam.

Naval Constructor Capps, who was with Admiral Dewey at Manila, has added the weight of his testimony in favor of sheathing ships, before the house naval committee. He maintained that it was necessary that ships, intended for long service in tropical waters, where dry docks are not accessible, should be sheathed. Rear Admiral Hichborn is receiving considerable support in his contention from the practical men of the navy.

The battleship Wisconsin at the Union Iron Works, San Francisco, is nearly ready for her official trial.

The naval board of construction has decided to postpone the sale of foreign vessels used as colliers until congress disposes of the ship subsidy bill, as the vessels being eligible for American registry would command better price if the bill becomes law.

Commander Richard Wainwright has assumed his duties as superintendent of the naval academy at Annapolis. The ceremonies attendant upon the event were simple, consisting merely of the hoisting of the superintendent's pennant at the peak of the ship Santee, upon which he and his family are quartered, and the firing of a salute of thirteen guns. Supt. Wainwright will remain in his present quarters on the Santee until April 1, at which time Admiral McNair will vacate the superintendent's house on shore.

The battleship Iowa is to be sent to Puget sound for docking and overhauling, the ship having been afloat for something like a year since her last docking and painting. The condition of the bottom of this ship and the consequent reduction in her speed and efficiency form strong arguments in favor of the system of sheathing as proposed by Chief Constructor Hichborn. The work on the Iowa will probably take at least a month, and perhaps longer, depending upon the actual state of her wetted surfaces.

The navy department is in a quandary in regard to the officers required for service with ships in commission. A statement furnished the secretary of the navy shows that it will take nearly 2,000 officers in addition to those on the active register to fully officer the ships now in commission. This does not make a liberal allowance for officers for shore duty, the most important of which work is that of the inspection of construction work and of material. It is even said that the department is considering the advisability of using civilians on this work.

As indicating the great advance which has taken place in the cost of new steamers in England as well as in this country of late, it may be mentioned that a firm of British ship owners, who in 1897 had a steamer built at a cost of £47,000, were recently in want of a similar boat, and applied for tenders, when, to their great surprise, they found that they could not duplicate the 1897 vessel under £60,000, showing an advance in price within two or three years of no less than £13,000. The owners have decided to wait till prices go down before they fill up their requirement.

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And now, after labored arguments on both sides, the question of sheathing the new battleships and armored cruisers has been left to the discretion of the secretary of the navy. The committee on naval affairs evidently did not care to take the time to dissect the extended arguments of the parties to the controversy. As the matter now stands, Rear Admiral Hichborn is somewhat in the lead. He has obtained the unqualified support of Admiral Dewey and a number of the naval constructors. In his original letter protesting against the recommendation of the majority of the board to strike out the phrase "to be sheathed and coppered," in the act authorizing the construction of the battleships and cruisers, he does not say that a copper bottom will never foul, because there is no known substance that will not attract marine growths, but he contends that copper, owing to the chemical salt which it produces, will resist growths from three to four years, while steel will resist them only two or three months. He submits figures to show that docking at all times is most expensive, and that at some times it is impossible. He contends also that sheathing materially strengthens the ship's bottom. He also quotes extensively from Sir William H. White of the British admiralty, who is a most thorough and consistent advocate of sheathing. He maintains that the fact that most of the huge battleships of continental navies are unsheathed simply implies that they are expected to perform most of their service in the comparatively contracted home waters with dry docks always at hand.

The majority in its reply treats Hichborn's letter lightly and admits that while it is an interesting contribution to the literature of sheathing it has no application to the sheathing of these particular three battleships and three armored cruisers. It also insists that his assumption that foreign battleships are not sheathed because they are expected to operate in home waters cannot be sustained by any sound process of reasoning. The majority admits that sheathing prevents fouling to a degree, but adds that the copper wears out and is a source of considerable and continued expense. The argument that it strengthens the ship's bottom is merely advanced to divert attention from the main issue. In the concluding letter Admiral Hichborn takes up every point advanced by the opposition and controverts it.

Gen. Grosvenor, chairman of the committee on merchant marine, has lately given out certain statements which make it apparent that the shipping bill, if presented for passage at all during this session, will not be presented until late. If the bill is to be passed during this session it should be presented at once, for it is a measure which, from its nature, will have to undergo thorough debate. The house committee has finally made public the amended form in which the bill will be presented to the house. As both senate and house bills are now practically identical the representatives of the foreign steamship companies, who are the natural opponents of the bill, may be expected to be heard from with greater vehemence than ever. In regard to the compensation allowed for carrying the mails, one thing is certain—the opponents must accept its provisions or admit that they are in favor of driving the American mail lines off the ocean. The effect of the latter course would be to throw the present compensation of $1,500,000, which the American mail carriers receive, into the pockets of the owners of British and German steamships. During the past year the Cunard and White Star lines received from Great Britain $616,209 for carrying the west-bound mails. The United States paid to these two foreign countries the sum of $245,720 for carrying its east-bound mail in default of American vessels for the service. In addition, the British admiralty paid to these two steamship lines the sum of $179,820 for their steamers as reserve cruisers, making a total of $1,041,749. Indeed, were it not for governmental support in the shape of mail contracts and compensation for auxiliary service, these fleets could not be kept afloat.

The committee on merchant marine of the National Association of Manufacturers has just sent out from the Philadelphia headquarters of the association one of the strongest documents as yet issued in support of the shipping bill. It is a report to President Theodore C. Search, going into every phase of the subject from a manufacturing standpoint. Accompanying the report is a series of resolutions adopted by the committee, in which it is provided that the president furnish all members of the association with copies of the committee's report, accompanied by the request that the membership individually, or by their various local organizations, take steps to convey to their representatives in congress information as to the vital interest to the manufacturers of America, which are involved in this pending legislation, and of the importance of early, practical and conclusive action. Members of the committee are: Ludwig Nissen, chairman, Ludwig Nissen & Co., New York City; Hugh J. Chisholm, International Paper Co., New York City; Norton P. Otis, Otis Elevator Co., New York City; Frank S. Jones, Jones Bros., Brooklyn, N. Y.; Julius Kayser, Julius Kayser & Co., New York City; S. I. Knight, Acme Stationery and Paper Co., Brooklyn, N. Y.; Royal C. Peabody, American Stoker Co., New York City; George J. Seabury, Seabury & Johnson, New York City; Henry Dalley, Jr., Lazell, Dalley & Co., New York City; Oscar Scherer, Oscar Scherer & Bro., New York City; George H. Robinson, Gorham Manufacturing Co., New York City.

The naval appropriation bill, being complete, can now be intelligently discussed. It provides for two new battleships, three armored cruisers and three protected cruisers. The battleships will cost about $3,600,000 each, exclusive of armor and armament, the armored cruisers about $4,000,000 each and the protected cruisers about $1,140,000 each. The sum of $12,000,000 is provided to continue the construction of ships already authorized. Two new dry docks are to be established—one at the Norfolk navy yard and one at the Brooklyn navy yard—each to cost $1,200,000. An item of $2,500,000 for cadets' quarters at Annapolis concludes the large appropriations. The committee authorizes the secretary of the navy to purchase Krupp armor at $545 per ton, and does not limit the amount. In other words, not only are the Maine, Missouri and Ohio to be equipped with Krupp armor, but the battleships authorized last year and those contemplated in the present bill as well. It is known that the executive department is in thorough accord with this action. Krupp armor has a resistance hitherto unknown in armors, and it would be a pound-foolish policy not to equip the battleships with it. The proposition to establish a government armor plate factory goes by the board. It was an arrant bit of nonsense to ever suggest it. It is to be hoped that congress will enact the program into law without quibbling.

The proposition to transfer from the navy department the work of the hydrographic office has met with violent opposition from all parts of the country. Hundreds of arguments are advanced for the retention of the naval hydrographic bureau to one in favor of its removal. The evidence is overwhelmingly in favor of naval supervision of this work. One of the most important branches of naval hydrographic work is the making of charts and the department has taken an especial interest in this feature. It is confessedly true that no charts exist in the world which are comparable to those issued by the hydrographic office in Washington. For over sixty years naval officers have gathered this hydrographic data for maritime charts, and they know exactly the information which the mariner wants. With wonderful alacrity the navy department has anticipated the wants of mariners. The Philippines had scarcely come into the possession of the United States government before naval vessels were cruising the waters, discovering the errors in the old Spanish charts and issuing new and accurate ones. During the past two years the legacy which it has bequeathed to the navigator is priceless. The naval hydrographic office should not be disturbed.

Nothing can more effectually discredit truthful statements of the enormous commerce of the great lakes than the publication of untruthful ones. This is well exemplified in a recent article in Ainslee's Magazine by Arthur J. Stringer, who has never been heard of in connection with lake affairs, but who makes the startling statement that in the year 1898 there passed through the Sault Ste. Marie canals no less than 21,234,664 tons of Canadian freight, having a value of $200,000,000, while American ships moved some 168,000,000 tons through the same waters for the same length of time. Against the statement of 168,000,000 tons, 21,234,664 tons seems small and robs the statistics of their significance. The passage of 21,234,664 tons of freight through these canals is a stupendous quantity and is a condition unforeseen even a few years since. The actual volume of freight (Canadian and American) which passed through these canals in 1898 was 21,234,664 tons, of which only 2 per cent. was Canadian. The total value of the freight was $230,069,000.

The antipathy to Rear Admiral Schley which obtains in the navy department was clearly manifested recently when circulars were sent to the chiefs of bureaus requesting them to subscribe to the Schley home fund The replies are valuable contributions to the bibliography of satire. The rear admirals steeped their pens in vitriol and condemned the undertaking and its promoters. The circulars were sent to the navy department inadvisedly. The Schley home fund is not making progress. Indeed the Dewey home fund would have proved a failure had not personal appeals been sent to a few rich men to contribute generously.

CAPT. JOSEPH NICHOLSON.

"A diamond in the rough" is the striking characteristic which the people of Detroit have bestowed upon Capt. Joseph Nicholson, who died in that city last Sunday. Capt. Nicholson was known to the older of the vessel men as one of the most honorable men who has ever sailed the lakes. He was born at Kilkeel, parish of Monrue, County Down, Ireland, Sept. 25, 1826, and came to this country when he was nineteen years old, landing at Quebec while on a cruise, for he had taken early to the sea. Indeed it was in Irish waters that he learned the trade of navigator. He secured his release instantly upon touching Quebec and came to the great lakes where for many years he was accounted one of the most skillful and truthworthy of navigators. In 1878 he forsook the lakes and accepted the position of superintendent of the Detroit house of correction, a post which he held at the time of his death. It would be impossible to recount in the narrow space alloted to this article the manifold sides of this man's character. It is enough to know that he became as a father to the inmates of the house and that for over twenty years the management of the institution has never met with the slightest reproach. Capt. Nicholson was a scrupulously honest man.

About 8 per cent. of the world's shipping now flies the German flag. From 1873 to 1894 the capacity of the German merchant marine increased by 139 per cent., and a further increase of 33 per cent. took place between 1894 and 1899. According to the "Germanic Lloyd," the year 1899 shows an addition of seventy-three steamships and thirty-two sailing vessels, and the total increase in carrying capacity between 1894 and the end of 1899 was 45 per cent. The average carrying capacity of the German vessels has made great gains since 1873. At the earlier date the average size of German steamers was 480 tons, but in 1898 it had risen to 849 tons. Among the steamers now owned in Germany are twenty-two of over 10,000 tons each.

Details of the Russian seven years (1898-1904) naval program are interesting. The program provides for eight battleships, one armored cruiser, six protected cruisers of 6,500 tons, ten cruisers of 3,000 tons, about twenty destroyers, and thirty torpedo boats, together with a submarine mine transport of 6,500, and a torpedo transport of 3,000 tons. All the eight battleships are of the first class; seven of them are to be of 12,674 tons.

AROUND THE GREAT LAKES.

If current report is correct the Barry Bros. of Chicago have made overtures for the purchase of the iron passenger and freight steamers India, China and Japan.

C. K. Keith of the United States geological survey is at Duluth making preparations for a survey of the Mesabi range. The United States has made geological surveys of all the Lake Superior ranges except the Mesabi.

W. J. Conners says of Thomas W. Kennedy who is to superintend for the Lake Carriers' Association the shoveling of grain in Buffalo next season: "He is as bright as a sunbeam, steady, clear-headed, straightforward and honest. I have known him from boyhood. He is the one man in all Buffalo suited for the place."

Detroit's new fire boat will undoubtedly be built by the Detroit Ship Building Co. The boat, which was designed in all her parts by Frank E. Kirby, will be one of the finest on the lakes. Bids opened on Monday last were: Jenks Shipbuilding Co., Port Huron, Mich., $105.000; Union Drydock Co., Buffalo, N. Y., $96,000; Detroit Shipbuilding Co., Detroit, Mich., $90,000.

Grand Captain C. Silva of Providence, and Grand Captain's Clerk Benjamin F. Perkins of Camden, N. J., leading officers in the American Association of Masters & Pilots, will visit harbor No. 42 of Cleveland, Lee Brogan, captain, on Saturday next and in the evening an open meeting will be held at No. 94 Superior street. A cordial invitation is extended to all masters and pilots to attend this meeting.

The house committee on rivers and harbors has made a favorable report on the bill to remove lightship No. 55 from Simmon's reef in Lake Michigan, near the straits of Mackinac, to Lansing shoal; also to remove the gas buoy from Lansing shoal to Simmon's reef. Congressman Burton of Cleveland, has this measure in hand and will undoubtedly secure its passage, as the change is desired by the vessel interests and no money appropriation is required.

W. J. Conners of Buffalo announces that the contract for the first elevator to be built at Montreal for the so-called Conners syndicate that is to develop the grain trade of the St. Lawrence river and the port of Montreal, has been let to James Stewart & Co. of St. Louis. The plans were drawn by the Barnett & Record Co. of Minneapolis, who will act as supervising architects. This first elevator in the Conners project will cost $1,000,000, will be of steel and will be capable of storing 3,000,000 bushels of grain.

Capt. Joseph Nicholson, whose death was announced from Detroit on Sunday last, was well known to vessel men in all parts of the lakes, although he had not been actively connected with shipping for twenty years past. He was warden of the Detroit house of correction. The captain was widely distinguished as an organizer and manager of prison industries. Under his supervision the Detroit prison, with its 600 inmates, including many federal prisoners, paid $60,000 annually to the city. Deceased was seventy-four years of age.

Capt. J. G. Warren of Milwaukee, United States engineer in charge of the construction and maintenance of light-houses in the ninth district, Lake Michigan and Green Bay, is compelled to charter a vessel on account of the scarcity of government tenders for this work. He has about $50,000 worth of light-house repairs in addition to new structures to look after next season. He wants a steam vessel of about 150 feet length, capable of carrying about 300 to 500 tons in hold and on deck and of not more than about 12 feet draught.

IN TOUCH WITH HIS VESSEL INTERESTS.

Although rarely heard of personally in connection with his vessel and ore interests on the great lakes, Andrew Carnegie seems to keep sufficiently in touch with these interests to strike the right key when he says anything regarding them for publication. Note his letter to the commercial organizations of New York at a recent dinner in honor of Gov. Roosevelt's efforts to improve the state canals:

"The point on which you deserve most credit, in my opinion, is that you stand for a barge canal as against a ship canal. Our experience of lake transportation—the carrying of 7,000 tons of ore in big ships on the lakes and its transfer at docks into cars, or into barges—is decidedly in favor of the transfer into barges from the big ship, as compared with the great ship crawling through any possible canal. The cost of transfer, under new and improved conditions, is so small that it far more than compensates for the difference in cost with the cheap barge manned by a few men and a monster costly ship with its full crew, and the question may be considered settled. That your committee should have pushed aside the more attractive popular idea of the big ship canal and reached the true solution shows how carefully it has done its work. Your committee is to be congratulated again for going far enough and not too far. To spend money upon the present plans for a canal would be a mere waste, while to spend the sum you name for a thousand-ton barge canal is, in my opinion, essential, if New York is to maintain her relative position. The recent purchases of railway stocks of the trunk lines by the two more prominent lines, thus ensuring mutuality of interest, must inevitably work against New York and in favor of the shorter rail line to tidewater at Newport News, Baltimore and Philadelphia. More than ever New York needs water transport to attract her share."

There are now enrolled in the Duluth customs district 272 vessels of about 230,000 tons. The Rockefeller vessels (Bessemer Steamship Co.) were all listed at Duluth as fast as they were built, and now that the whaleback fleet of ten steel steamers and twenty steel tow barges are owned by the Bessemer company they are also to hail from that port.

In order to care for the large number of gas buoys that are used on the Detroit, St. Clair and St. Mary's river, the light-house tender Marigold of the eleventh district is being fitted with a gas compressing. It is hoped that a greater number of buoys than were in use last year will thus be cared for, but a new tender for this very important district must be secured.

MASTERS AND ENGINEERS.

APPOINTMENTS OF OFFICERS FOR SHIPS OF THE GREAT LAKES, SEASON OF 1900.

Tonawanda Iron & Steel Co., Tonawanda, N. Y.: Steamers—C. F. Curtis, Capt. James Cunningham, Engineer W. J. Cunningham; John F. Eddy, Capt. T. R. Forton, Engineer T. F. Patrick; Clyde, Capt. J. S. Neal, Engineer John Leahy; Oceanica, Capt. C. S. Furey, Engineer Thomas Bluett; Veronica, Capt. David Carrier, Engineer W. J. Reardon; William H. Gratwick, Capt. Edward Sullivan, Engineer R. E. Walker; George Spencer, Capt. Andrew C. Hansen, Engineer H. J. Gregg. Schooners—Moravia, Capt. Peter Keischgens; B. L. Pennington, Capt. W. S. Johnson; Amboy, Capt. George O. Reece; Whaleback 101, Capt. J. J. Carr; N. C. Holland, Capt. John H. Christie; T. S. Fassett, Capt. Frank P. McGreevy; Isabel Reed, Capt. Peter Johnson.

Rutland Transit Co., J. G. Westbrook, general superintendent, Ogdensburg, N. Y.: Steamers—Gov. Smith, Capt. W. S. Shay, Engineer John N. Phillips; F. H. Prince, Capt. D. A. Kiah, Engineer John Alexandire; H. R. James, Capt. Jas. Owens, Engineer Jas. Trumbull; W. A. Haskell, Capt. E. B. Shay, Engineer Morris Gore; W. J. Averill, Capt. Wm. Wait, Engineer H. M. Burton; Jas. R. Langdon, Capt. Harvey Brown, Engineer Jas. Chestnut; A. McVittie, Capt. W. H. Williams, Engineer D. G. Costello; W. L. Frost, Capt. T. M. Hough, Engineer L. O. Willix.

Egan, W. M., Chicago: Steamers—Philip D. Armour, Capt. F. D. Chamberlain, Engineer Jacob Berry; John Plankinton, Capt. L. H. Powell, Engineer James Rossau; Wiley M. Egan, Capt. Fred Howe, Engineer Fred Coleman; R. P. Fitzgerald, Capt. L. E. Boyce, Engineer John W. Patterson.

Crosthwaite, J. L., Buffalo: Steamers—Niagara, Capt. M. A. Budd, Engineer W. P. Boynton; St. Louis, Capt. Jas. Brines, Engineer D. Struble. Tug—S. M. Fischer, Capt. Fred Johnson, Engineer G. A. Rogers. Car Ferry Barges—No. 3, Capt. Wm. Chambers; No. 4, Capt. Wm. Burkhart.

Lackawanna Transportation Co., M. M. Drake, manager, Buffalo: Steamers—Lackawanna, Capt. Frank W. Weinheimer, Engineer Charles VanEvery; Scranton, Capt. James H. Green, Engineer Frank D. Fredricks; Russia, Capt. John D. Green, Engineer William Brown.

Nester, George, Detroit, Mich: Steamer—Schoolcraft, Capt. Thomas J. Carney, Engineer ————. Schooners—George Nester, Capt. Fred W. Trent; Mary N. Bourke, Capt. Frank Reeves; Keweenaw, Capt. Henry Balfour.

Northern Michigan Transportation Co., Chicago: Steamers—Illinois, Capt. William Finucan, Engineer Thomas Collins; City of Charlevoix, Capt. Peter McGuiggan, Engineer James W. Myers.

Corning, Gurdon, Saginaw, E. S., Mich.: Steamer—C. H. Green, Capt. Charles E. Little, Engineer ———. Schooners—Genoa, Capt. D. C. Ryan; Our Son, Capt. G. W. Ryan.

South West Transportation Co., Charles T. Williams, manager, Cleveland: Steamer—A. G. Lindsay, Capt. C. H. Woodford, Engineer Charles Burns.

Ionia Transportation Co., Frank M. Thompson, manager, Detroit: Steamer—Ionia, Capt. Alexander Craigie, Engineer Thomas Brand.

Jean, August, Buffalo: Steamer—Samuel Marshall, Capt. August Jean, Engineer John Shean. Schooner—Kingfisher, Capt. J. Gargon.

A MODEL WOODEN SHIP.

It would be a difficult task to find in the whole country a fleet of vessels that are more carefully kept up, to use a sailor term, than those managed by W. C. Richardson of Cleveland. A glance over his schooner Chickamauga, a large wooden vessel—334 by 45 by 21½ feet—is sumcient evidence of the exacting manner in which he gives attention to every detail aboard his vessels. This schooner, built only a short time ago and already well equipped, might have gone along for several years without a great deal of attention, but after being laid up in Cleveland last fall she was made the equal of any of the finest steamers in the matter of equipment other than propelling power. Steam steering apparatus of a most substantial kind was installed in connection with a new rudder. Decks had been caulked, and then, just before taking on cargo, ceilings were caulked and she was thoroughly caulked outside from keel to covering board. In connection with the new steering apparatus, there was built on deck just forward of the after house a commodious wheel house, in which is provided most comfortable quarters for the wheelsmen. A donkey engine with a large boiler furnishing steam at 100 pounds pressure is provided for working steam steerer and steam windlass, and there is one hand pump, two 10-inch steam pumps and two steam syphons, as well as two 3,000-pound stockless anchors. Altogether the Chickamauga is a model schooner.

Some time ago it was thought the Lehigh Valley Transportation Co. of Buffalo, would place with lake ship builders an order for three package freight steamers of 5,000 to 6,000 tons capacity, in addition to the large freighter now building at the works of the Union Dry Dock Co., Buffalo. Now it is said that the negotiations for three more steamers are off, but that the Union Dry Dock Co. very probably has an order for one more steamer, announcement of which will be made shortly. It is true that the Bertram Engine Works Co. of Toronto, another lake concern, also has an important new order. As rumored several days ago, the Bertram company will build for the Richelieu & Ontario Navigation Co. a side-wheel passenger steamer somewhat larger than the Toronto, built for the same company a short time ago. The rumor regarding a new passenger steamer costing $350,000 to $400,000 for the Goodrich Transportation Co. of Chicago, is very probably premature. No doubt the Goodrich company, which employs its own naval architect, Mr. W. J. Wood, has considered plans for such a vessel, but the condition of affairs in the large ship yards of the lakes would not permit of work being commenced on such a vessel for several months to come, even if it were decided to let the contract at once.

BRITISH NAVAL PROGRAM.

FULL EXPLANATION OF THE ADMIRALTY'S REASONS FOR LOW ESTIMATES—SCARCITY OF OFFICERS AND MEN, AS WELL AS MATERIAL FOR NEW SHIPS ALREADY UNDER WAY—NO TORPEDO BOAT DESTROYERS.

FROM UNITED SERVICE GAZETTE.

At a time when well nigh the whole of Europe echoes to the hum of naval preparations on a scale of magnitude hitherto unknown, it may, we hope, be accepted as a happy augury for this country that Mr. Goschen and his professional advisers are able to take for their watchword the formula Restez tranquille. The British public, roused from their normal condition of indifference by the threatening attitude assumed by continental powers, were prepared to grant additional ships of all classes to any extent considered necessary, and lo! Mr. Goschen, as the chief feature of the new ship building program for the year, proposes to lay down two battleships and six armored cruisers. Many reasons might be adduced to prove the wisdom of thus proceeding with caution rather than with haste, in deciding upon the measures to be taken by way of response to the increased armaments of the other powers. Taking as the test of a satisfactory position with respect to relative strength that England should be equal to two at least of the other navies, acting together, the parliamentary report recently issued shows that there is no ground for disquietude on this head. Moreover, by reason of the fact that it is easier to construct a huge fleet than to collect the body of thoroughly trained officers and seamen required to man the ships of such a fleet, it appears at present as if the number of ships had already somewhat outgrown the supply of officers and men, so that in the event of a general naval mobilization it would be difficult to find crews wherewith the whole number of newly-commissioned ships might be adequately manned. But the strongest reason of all, and one which, if satisfactorily established, renders further argument against undertaking any considerable amount of new construction at present unnecessary, is this, that during the financial year now drawing to a close the amount of contract work paid for fell short by nearly a million and a half of the sum provided in the estimates, so that our proper policy seems clearly to lie in the direction of getting some of these arrears partially made up before embarking upon any further schemes of ship building development.

The net total of the estimates for the present year amounts to £27,522,600, being an increase of £928,100 upon the amount voted for the year 1899-1900. Of this increase the sum of £447,600 may be regarded as automatic, being due partly to the increased numbers of men voted, to the grant of higher pay to the marines, and to improvements in pay and allowances of the medical service. A considerable amount of unforeseen and exceptional expenditure, due chiefly to the war in South Africa, was necessarily incurred; amongst other items there was an excess of £350,000 for extra coal supplies, of £300,000 for victualling, and of £300,000 for naval stores other than coals. In all something over a million in excess of the estimated amount was thus expended, and in the ordinary course of events a supplementary estimate would have been rendered necessary. By an arrangement with the treasury, however, the deficiency was met out of the unspent balance of the vote for contract work, to which reference was made. A suggestion put forward in certain quarters, that the payments for contract work were purposely kept down to provide a surplus out of which the exceptional South African charges might be defrayed, seems hardly to require any formal refutation. The statement of the first lord shows that the deficiency was to him a matter of keen personal disappointment.

Should the new ship building program meet with the approval of parliament, the list of vessels of all classes which will be in process of construction during the year will include seventeen battleships, twenty armored cruisers, one first-class protected cruiser, two second-class protected cruisers, one third-class cruiser, eight sloops, two light-draught gunboats, four torpedo boats, twenty-one torpedo-boat destroyers, one royal yacht. With regard to the battleships building, it may be remarked that the seventeen ships in progress will about enable us to replace the antiquated vessels, of twenty-five years of age and upwards, which still figure upon the lists as efficient men-of-war. Such ships as the Hercules, thirty-two years old, and the Triumph, Swiftsure and Sultan, all in their thirtieth year, with their inefficient armor and muzzle-loading armament, may well be regarded as past their work, and it will be a matter of congratulation when they can be replaced by modern vessels. But the net result of such a substitution of new ships for old must necessarily be this, that for several years to come we must expect that the British battleship total cannot be expected to exceed the number, fifty-three, at which it is set down at present.

With respect to individual battleships recently completed, or now approaching completion, the first lord's statement gives many interesting particulars. The Canopus was completed in December, and is now on service in the Mediterranean. The Ocean and Goliath will be completed this financial year, the former indeed is even now in commission. These three ships are all of the same type, of 12,950 tons displacement, and having a principal armament of four 12-inch breech-loading guns, with twelve 6-inch, and eighteen smaller quick-firers. All have been constructed in the royal dock yards. Three other ships of the Canopus class have been building by private contractors, the Glory at Birkenhead, the Albion at Blackwall, and the Vengeance at Barrow-in-Furness. Of these, the Glory has recently been running her steam trials, the Albion will, it is hoped, be ready shortly, and the remaining ship, the Vengeance, laid down eight months later than her two sisters, is expected to be delivered next July. The Formidable class, which also numbers six vessels, are larger than those of the Canopus type by 1,150 tons, and their estimated speed is 18 knots, as compared with 18¼ knots. Their armament is the same as that of the Canopus, except that they carry six additional quick-firers. It is anticipated that the Formidable, Irresistible and Implacable will be completed by March, 1901, and the London, Bulwark and Venerable during the autumn of 1901. By December, 1901, therefore, we may anticipate that the places of twelve of our obsolete so-called battleships will have been taken by a similar number of vessels of the newest type, which in speed, protective armor, and armament may be regarded as equal to any that the world can produce.

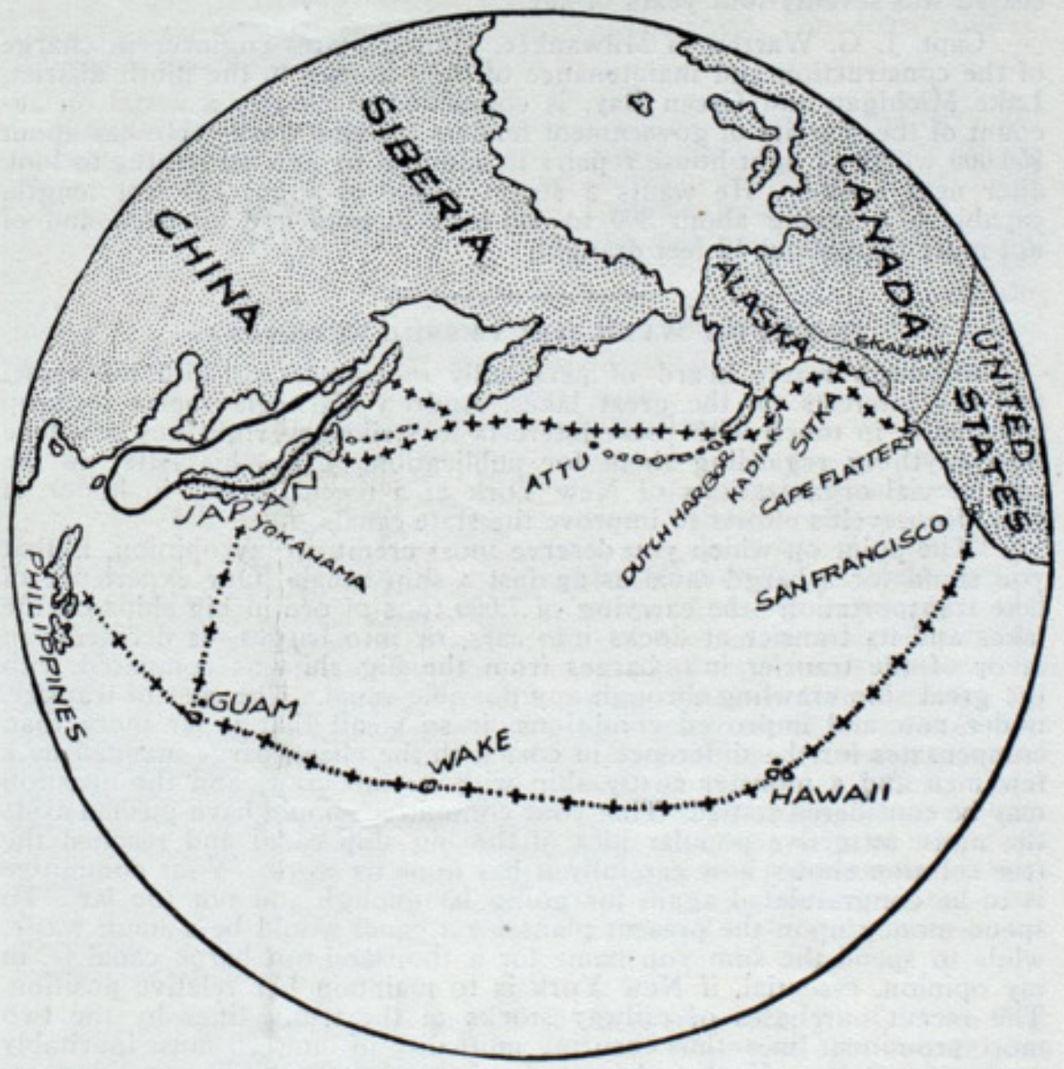
With regard to armored cruisers, the prospects are hardly so bright. Of six vessels of the Cressy class of 12,000 tons and 21 knots speed, it is hoped that two will be delivered during the year 1900-1901. The Drake class is of 14,100 tons and 23 knots, but none of this class will be completed sooner than the year 1902, and the Monmouth class, of 9,800 tons and 23 knots, containing four vessels, shows an equally backward condition. Next to the cruiser the most important type of modern war vessel is probably the destroyer. Until quite recently, Great Britain has enjoyed a practical monopoly of these vessels, and the flotilla which she possesses today is regarded upon the continent with feelings of considerable respect. The sudden awakening which has taken place all over the world as to the value of the destroyer in modern naval warfare is sufficiently shown by the following table, correct to Oct. 31 last:

	Destroyers built.	Destroyers building.
Great Britain	75	33
France	2	10
Russia	1	35
Germany	1	19
Italy	—	11
United States	1	19
Japan	8	—

In all there were eighty-eight such vessels completed, of which seventy-five belong to Great Britain; 127 building, whereof Great Britain claimed thirty-three. Hardly ever in the history of modern naval developments has this country taken such a decided lead in the construction of a new type of vessel. It may seem strange under the circumstances just described that no new destroyers figure in the estimates for the coming year. For an explanation, we turn again to the first lord's statement. Until lately it appears that 30 knots has been the limit of speed attained by this class of war vessel. Four new experimental vessels have recently been constructed, intended to exceed this rate, one of which obtained 32 knots, and has been delivered. Another of this type is in an early stage of construction. A third, designed for 33 knots, has been under trial, but has not yet attained that speed. The fourth vessel, the Viper, is, however, the one in which the greatest interest is centred. She is fitted with Parsons' steam turbine, and while the speed contracted for was about 31 knots, she has already attained, on preliminary trials, a speed of 35 knots. We can readily appreciate the force of Mr. Goschen's comment that "great importance attaches to this novel system of propulsion," and it is easily intelligible that, while such developments are in progress, the admiralty does well in the matter of laying down new destroyers to hold its hand.

TWO CABLE ROUTES ACROSS THE PACIFIC.

The government is considering two cable routes across the Pacific and both have earnest advocates. The first pursues a southerly course and is known as the all-American route via Hawaii, Wake and Guam. This route is immense in its stretches. It runs from San Francisco to Honolulu, a distance of 2,403 miles, thence to Guam, a distance of 3,950 miles, thence to Manila, a distance of 1,784 miles. An added branch to



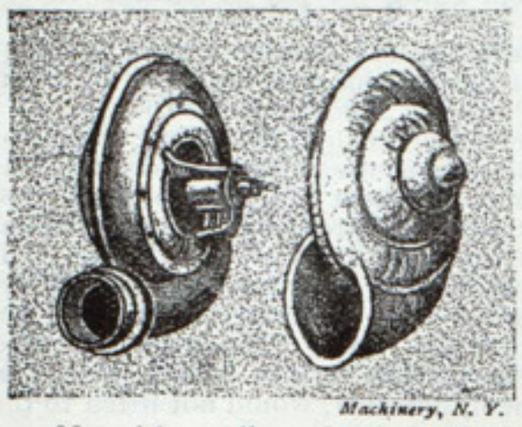
Yokahama would stretch 1,805 miles. Owing to the extraordinary depth of the sea between Midway island and Guam, a single cable link of 2,639 miles would be required.

Another route suggested is one which starts at Cape Flattery, the northwestern point of the state of Washington, and runs to Sitka, a distance of 803 miles, thence to Kadiak island, a distance of 682 miles, thence to Dutch harbor, a distance of 770 miles, and thence to Attu in the Aleutian islands, a distance of 810 miles. From Attu the cable would run to Cape Lepatka in Russia and Koorile islands belonging to Japan, a distance of 858 miles. The foreign countries which this cable would touch would be Russia and Japan. The southern cable traverses 9,942 miles and the northern 5,550 miles.

The contract for the erection of a ship fitter's shop at the Norfolk navy yard has been awarded to the Penn Bridge Co. of Beaver Falls, Pa., at $33,333.

RESEMBLES A SNAIL SHELL.

In a recent issue of Machinery, Mr. W. H. Sargent makes a novel comparison between the shape of certain well known mechanical devices and that of familiar natural objects. "Take for example," he says, "a rotary fan or blower, and one is so struck with the resemblance to a snail shell as to warrant the belief that the designer was familiar with such shells and has recognized the suitability of the design as a guard to cover delicate and easily injured parts. There could hardly be greater contrast than between the swiftly revolving fan and the slow moving snail, yet it is difficult to resist the impression that the shell had somehow unconsciously influenced the mind of the designer." This resemblance is shown in the illustration.



Machinery, N. Y.

Notwithstanding this startling resemblance, it is, however, to be questioned whether Mr. B. F. Sturtevant who was the originator of this type of fan blower, was in the least degree so influenced in perfecting his designs.

PHILADELPHIA PNEUMATIC TOOLS.

A letter just received from the Philadelphia Pneumatic Tool Co., Stephen Gerard building, Philadelphia, announces that they have recently completed arrangements with the Keller Tool Co. of Philadelphia, to market their entire output of pneumatic tools and appliances. The Keller tools have been well known to the trade for the past ten years, but attention is especially directed now by the Philadelphia company to what are known as the new Keller tools.

"These tools," says the letter, "have been recently designed and perfected, and include hammers of all sizes for chipping, calking, beading flues, and driving rivets; also drills of both the rotary and piston types, in all sizes; also yoke and hand riveters, air-motor chain hoists, and pneumatic sand rammers for foundry use, together with fluted reamers, flue rollers, flue cutters and all other appliances that go to make up a complete line of pneumatic machinery. We have adopted a liberal policy in the matter of sending tools on trial, and shall cheerfully do this when requested by responsible users, such trial being limited to ten working days.

"Our reamers are specially made for use in connection with pneumatic tools in the exacting service required in ship yards, bridge shops, locomotive shops, boiler shops and railroad shops. They are made of a special grade of steel, carefully machined and tempered. Each reamer is thoroughly inspected and fully guaranteed. Reamers that are defective in material or workmanship will be cheerfully replaced if returned within a reasonable time. Special reamers for any work will be made to order in any quantity. We are confident our reamers cannot be excelled for hard and continuous service."

MACHINE-SEWED SAILS.

Geo. B. Carpenter & Co., ship chandlers of Chicago, are sending out to vessel owners samples of sail duck showing their machine-made seam and also the thread they use.

"Machine-sewed sails have been used for years," they say, "on small craft, but it is only in the last year that heavy sails and hatch cloths have been successfully made by machine. They are now so popular on the seaboard that we have put in special machinery for their manufacture. We have made thorough tests to determine the relative strength and durability of machine and hand-sewed work and in every trial the machine-made seam has withstood the heavier tension. The other points of advantage are the very smooth, uniform appearance and the decreased cost. During the past winter we have turned out a great many large machine-made sails and hatch cloths of the heaviest class and the work has been praised by every vessel owner and captain who has had occasion to visit our lofts. Our confidence in this new method of manufacture is such that we will guarantee any machine work to last as long or longer than hand-sewed."

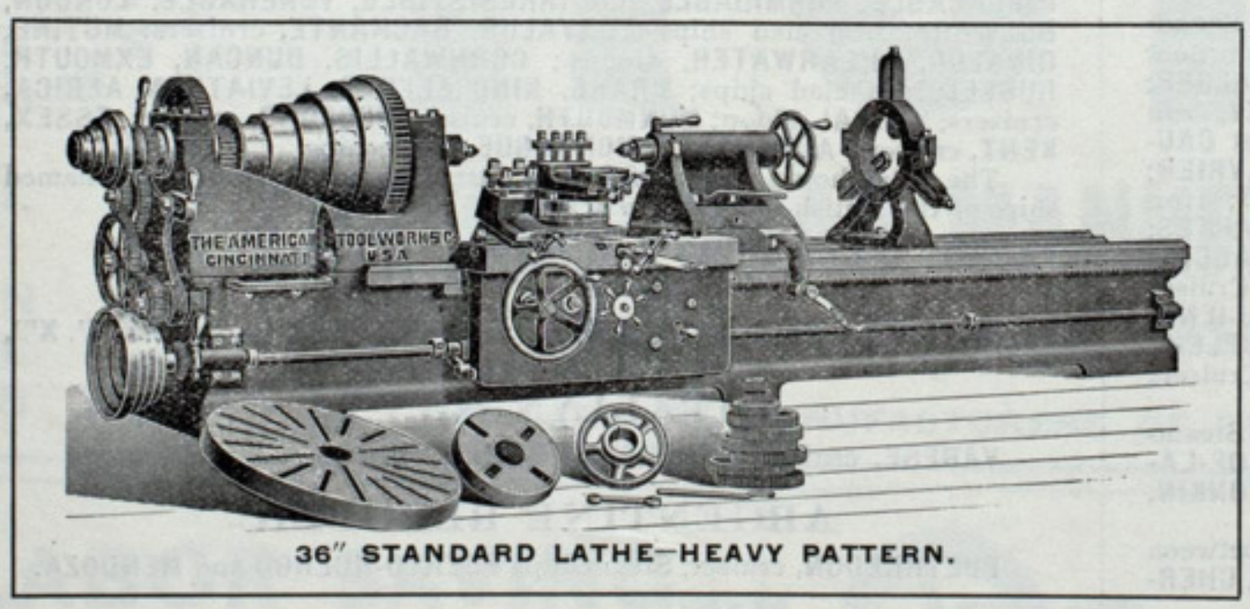
A list of vessels in which the Babcock & Wilcox Co. of New York are installing their water tube boilers includes on the great lakes five steamers of about 7,000 tons capacity each, which are being built by the American Ship Building Co. for Carnegie interests, and four steamers of 8,000 tons capacity each (Wolvin fleet) building for the American Steamship Co. On the Pacific coast this type of boiler is going into ten large steamers. The list of United States naval vessels to be similarly equipped includes the monitor Wyoming, cruisers Cincinnati and Raleigh, and protected cruisers Tacoma, Galveston and Chattanooga. These boilers are also to be used for the government floating dry dock at Algiers and the steam dredge Texas City.

The Berlin Iron Bridge Co. of East Berlin, Conn., has increased its capital stock to $750,000, and has made extensive purchases of land at Pittsburg where they will start a branch. They have already placed orders for the greater portion of the machinery equipment, and are now at work on plans for the buildings, which will be quite extensive, designed and built by themselves at their own shops. It is intended that this plant shall be fully equipped with all modern appliances for doing all classes of steel bridge and structural work; in fact the layout promises that it will be the best plant of the kind in the country.

At the recent meeting of the stockholders of the Boston & Lockport Block Co., held at the office at Lockport, N. Y., the following directors were elected: Hon. A. D. Bosson of Boston, Frank Gebbie of St. Johnsville, N. Y.; Mrs. Adelaide C. Beverly of Lockport, N. Y., and Myron H. Tarbox of Boston, Mass. At a subsequent meeting the directors elected from their number: For president, Albert D. Bosson; vice-president, Frank Gebbie; secretary and treasurer, Myron H. Tarbox; assistant secretary, Alfred B. Tarbox.

The bill to change the name of the American liner Paris to Philadelphia has been favorably reported to the senate.

Tools for Economical Production.



36" STANDARD LATHE—HEAVY PATTERN.

We build complete lines of Machine Tools for machine shop equipments, viz:

Lathes, Planers,
Drills, Shapers,
Boring Mills, Etc.

Investigate our lines before buying.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

NEW YORK OFFICE: 120 Broadway, Geo. Place, Agent.
NEW ORLEANS: The Fairbanks Co.
CHICAGO STORE: 68-70 South Canal Street.
PHILADELPHIA: The Fairbanks Co.
CLEVELAND: The Strong, Carlisle & Hammond Co.
BOSTON STORE: 36 Federal Street.
BALTIMORE: The Fairbanks Co.

SAN FRANCISCO: Henshaw, Bulkley & Co.
DENVER AND SALT LAKE CITY: The Mine & Smelter Supply Co.
LONDON: Alfred Herbert, Ltd., 7 Leonard St., Finsbury, E. C.
DÜSSELDORF: de Fries & Co., Act. Ges., Graf Adolf Strasse, 83-87

ANTWERP: Nyssens Fréres, 33 Rue des Peignes.
BERLIN: de Fries & Co., Act. Ges., Kloster Strasse, 13-15.
PARIS: Roux Fréres & Cie., 54 Boulevard du Temple.
MOSCOW: Alfred Stucken.

TRADE NOTES.

The Cleveland office of the Bethlehem Steel Co. has been moved to 312 Perry-Payne building (Mr. Walter Miller, representative) and the St. Louis office to No. 502 N. Second street.

It is claimed for the Sterling lubricator, made by the Sterling Lubricator Co., 340 Powers building, Rochester, N. Y., that it is the only automatic force feed pump lubricator having hand attachment and which may be adjusted while in full motion without danger.

An instructive and well-indorsed catalogue comes from the firm of Cole & Kuhls of New York, manufacturers of elastic seam composition and elastic seam paint. The catalogue will be sent to anyone upon application. It excellently sets forth the merits of the composition and the paint.

Rainbow packing, manufactured by the Peerless Rubber Manufacturing Co. of New York, is especially adapted for very high pressure and is not affected by oils, ammonia, steam, heat or alkalies. It is claimed for it that joints can be made and broken in one eighth the time consumed with packings that harden.

The navy department has placed an order with the New York Air Compressor Co., 120 Liberty street, New York, for two duplex compound air compressors of 500 feet per minute capacity each for the Charleston navy yard, Boston. This very probably means more pneumatic tools at the Charleston yard.

One of the most beautiful catalogues that has ever come to our notice is the one just issued by the General Electric Co. on the subject of marine electrical apparatus. It is superbly illustrated with half tone pictures of battleships and cruisers of various navies, and also of motors, generators and searchlight projectors adapted for marine service.

A water tube boiler that will undoubtedly be heard of in all parts of the country in the near future is that manufactured by the Dearing Water Tube Boiler Co. of Detroit. This company has just issued an attractive catalogue, in which they thoroughly set forth the advantages of their boiler. In the Dearing boiler no expanded joints, lock-nuts or unions are used.

A large steamyacht, built for A. H. Alker of New York and named Florence, was launched this week from the works of the Herreshoff Manufacturing Co., Bristol, R. I. The lines of the boat are similar to the Eugenia, formerly owned by John B. Herreshoff, except that the Florence is considerably larger. She will be rigged as a schooner. The yacht will be enrolled in the Newport yacht club.

The Berlin Iron Bridge Co. of East Berlin, Conn., will open an office at Rooms 909-910 Stephen Girard building, Philadelphia, on the 15th. The office will be in charge of Mr. L. H. Brumbaugh, who has been with the bridge company for a number of years.

WASHINGTON NEWS NOTES.

The bill appropriating $50,000 for transforming the Thetis into a revenue cutter for service on the Pacific coast has passed the senate.

Senator Frye has introduced a bill fixing the pay of surfmen in the life-saving service at $65 per month.

A bill has been introduced in the house to establish a naval training ship on the Mississippi, a gunboat of the Helena type modified, of about 1,500 tons displacement, to cost, exclusive of armament, $450,000.

Arthur Sewall of Bath, Me., who ran upon the Democratic ticket for vice-president in 1896, has been making strenuous efforts before the war department to divert a portion of the government freight shipments from the steam transports to his sailing ships. He promised the government to establish semi-monthly sailings from San Francisco to Manila if it would employ his ships in the transportation of government property. He maintained that there would be but little difference in the time of passage, and represented that as he would return with cargo he could carry the equipment cheaper than the present service which returns in ballast. The quartermaster's department, however, would not listen to the proposition.

Admiral Dewey will command a "great lakes" squadron while Chicago pays him homage in May. Secretary Long will be asked to order the Michigan to drop anchor off Chicago on Dewey day, and Secretary Gage will be requested to detail the revenue cutters Fessenden and Morrill for service there. With the government vessels as a nucleus, it is planned to assemble a great fleet of lake craft of freighters, passenger ships and yachts.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of March 21. 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire.....	55¼	56¼	54¼	56⅛
American Steel & Wire, Pfd.....	90¼	.....	.....	90¼
Federal Steel	51⅛	52⅜	50¾	52⅛
Federal Steel, Pfd.....	74½	75½	74½	75
National Steel	43½	44	41⅞	43¾
National Steel, Pfd.....	96	96½	96	96¼
American Tin Plate	33½	33¾	33½	33¾
American Tin Plate, Pfd.....	.....	.....	.....	.....
American Steel Hoop.....	34½	35¼	34⅛	35¼
American Steel Hoop, Pfd.....	81	81	80	80½
Republic Iron & Steel	21½	22½	21½	22½
Republic Iron & Steel, Pfd	66	.....	.....	66

BELLEVILLE GENERATORS.

GRAND PRIZE AT THE WORLD'S FAIR OF 1889.

List of Ocean Steamships on Board which BELLEVILLE GENERATORS are Used.

FRENCH NAVY.

Despatch Boat **VOLTIGEUR**; Squadron's Look-out Ship **MILAN**; Squadron's Look-out Ship **HIRONDELLE**; Gunboat **CROCODILE**; Despatch Boat **ACTIF**; Cruiser **AMIRAL RIGAULT DE GENOUILLY**; Iron Clad Cruiser **ALGER**; Iron Clad Cruiser **LATOUCHE-TREVILLE**; Iron Clad Cruiser **CHANZY**; Iron Clad Cruiser **AMIRAL CHARNER**; Tug **ABERVRAC'H**; Despatch Boat **CAUDAN**; Torpedo Despatch Boat **LEGER**; Torpedo Despatch Boat **LEVRIER**; Battleship **BRENNUS**; Protected Coast Guard **AMIRAL TREHOUART**; Iron Clad Cruiser **BRUIX**; Iron Clad Cruiser **BUGEAUD**; Cruiser **DESCARTES**; Battleship **BOUVET**; Cruiser **POTHUAU**; Cruiser **GALILEE**; Cruiser **PASCAL**; Cruiser **CATINAT**; Battleship **CHARLEMAGNE**; Cruiser **LAVOISIER**; Cruiser **PROTET**; Battleships **GAULOIS, SAINT LOUIS** and **HOCHE**; Iron Clad **IENA**; Cruiser **DESAIX**; Iron Clad Cruiser **DUPETIT-THOUARS**; Cruiser **DUPLEIX**; Cruiser **FURIEUX**; Battleship **NEPTUNE**; Battleship **DEVASTATION**; Cruisers **SULLY, AMIRAL AUBE** and **MARSEILLAISE**.

MESSAGERIES MARITIMES: Cargo Steamer **ORTEGAL**; Mail Steamships **SINDH, AUSTRALIEN, POLYNESIEN, ARMAND-BEHIC, VILLE-DE-LA-CIOTAT, ERNEST-SIMONS, CHILI, CORDILLERE, LAOS, INDUS, TONKIN, ANNAM, ATLANTIQUE**.

COMPAGNIE DES CHEMINS DE FER DE L'OUEST, (Plying between Dieppe and Newhaven): Freight Steamers **ANGERS, CAEN, BREST, CHERBOURG**; Fast Steamers **TAMISE, MANCHE, FRANCE**.

RUSSIAN NAVY.

Iron Clad Frigate **MININE**; Gunboat **GROZIASTCHY**; Imperial Yacht **MAREVO**; Imperial Yacht **STRELA**; Gunboat **GREMIASCHY**; Gunboat **OTVAJNI**; Imperial Yacht **TZAREWNA**; Imperial Yacht **STANDARD**; Cruiser **ROSSYA**; School Ship **VERNY**; Cruiser **SVETLANA**; Cruiser **DIANA**; Cruiser **PULLADA**; Torpedo Transport Boat **BAKAN**; **KHERSON** and **MOSKBA**, Ships of the Volunteer Fleet; Gunboat **GILACH**; Iron Clad **EKATERINA II**; Gunboat **KOUBANETZ**; Cruiser **AURORA**; Iron Clad **EMPEREUR NICOLAS I**; Iron Clad **PRINCE POTIEMKINE DE TAURIDE**; Cruiser **BAYAN**; Iron Clad **CESAREWITCH**; Gunboats **TERETZ** and **OURALETZ**; Iron Clad **BORODINOW**; **SMOLENSK**, Ship of the Russian volunteer fleet; cruiser **BOJARINE**.

ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM, ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGUE**, battleships.

The total horse power of boilers fitted on board the 57 above named ships of the British navy is nearly 900,000.

AUSTRIAN NAVY.

BUDA-PEST, iron clad coast guard; **KAISER KARL VI**, cruiser; **X', X'''**, battleships.

ITALIAN NAVY.

VARESE, cruiser; **BENEDETTO BRIN**, battleship.

ARGENTINE REPUBLIC.

PUEYRREDON, cruiser; Steamships **PUERTO-HUERGO** and **MENDOZA**.

SPANISH NAVY.

REINA REGENTE, cruiser.

CHILIAN NAVY.

O'HIGGINS, cruiser; **ALMIRATE LYNCH**, torpedo boat destroyer; **ALMIRANTE CONDELL**, torpedo boat destroyer; **GENERAL BAQUEDANO**, school ship.

JAPANESE NAVY.

SHIKISHIMA, iron clad; **CHIYODA**, cruiser; **ASAHI**, iron clad; **IWATE**, cruiser; **AZUMA**, cruiser; **HATSUSE**, iron clad; **ITSUKUSHIMA**, iron clad coast guard; **MIKASA**, battleship.

UNITED STATES OF AMERICA.

Northern Steamship Co.'s Passenger Steamers **NORTH WEST** and **NORTH LAND**, of 7,000 H. P. each; yachts **SHEARWATER, CORYELL, WILD DUCK, SULTANA**.

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GREAT LAKES REGISTER FOR 1900.

The 1900 issue of the Great Lakes Register, Capt. F. D. Herriman of Cleveland, chief surveyor, is just from the press and will be distributed among subscribers within the next few days. It is without doubt the most complete classification of a fleet of ships to be found in all the world. The books issued by Lloyds of England and by the Bureau Veritas of France are, of course, of far wider scope, but the use of the term complete in connection with the book of the great lakes has reference to the extent to which it enters into particulars of some 4,500 vessels of the lake fleet. In this regard the Great Lakes Register is certainly a wonderful publication. Enough information in the case of each vessel is given to require almost a page of an ordinary book, but it is so condensed by the aid of symbols and abbreviations (all of them very clear) that only a line across two pages is required. Hull, engines, boilers, auxiliaries, electric plants, etc., are all dealt with. Best of all, the new book is little more than half the size of the first issue. This was done, without diminishing the value of the book in the least, by the use of lighter weight but more costly paper. A very clear map of the lake system is a feature of the 1900 issue.

The senate has passed the act to construct a revenue cutter for St. Mary's river.

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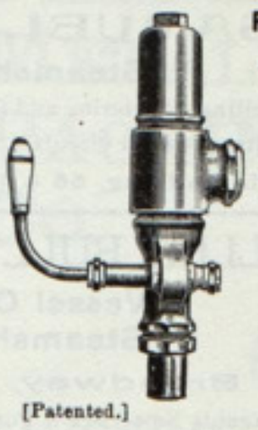

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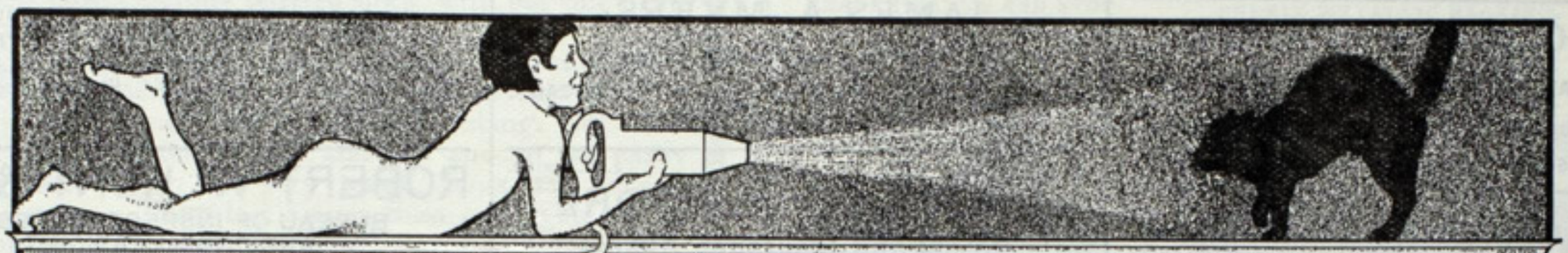

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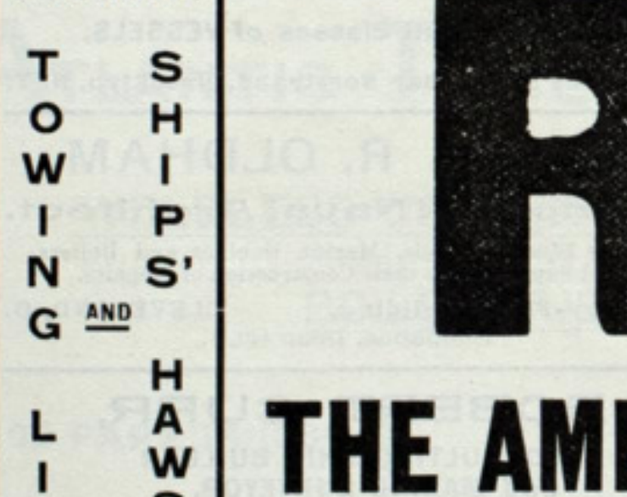

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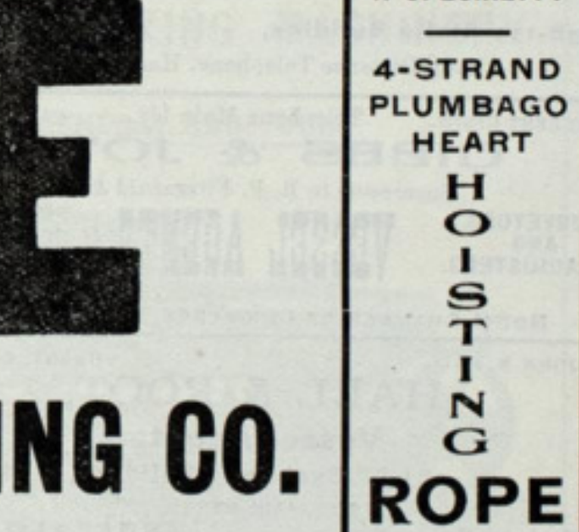

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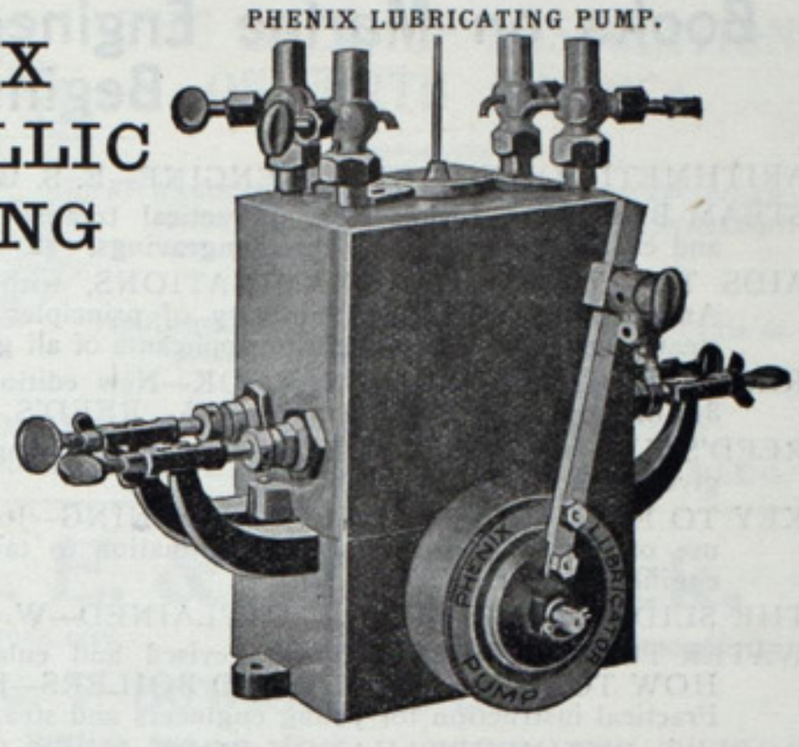

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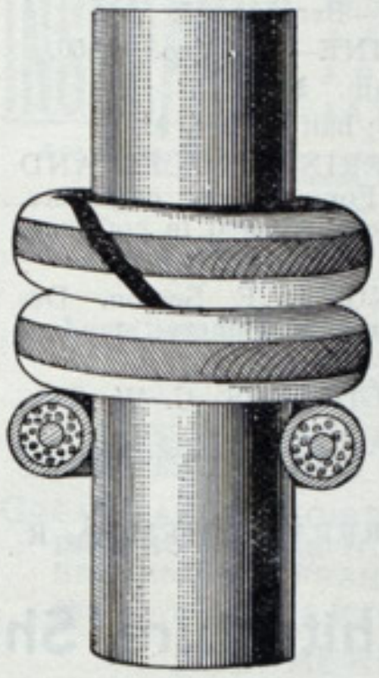

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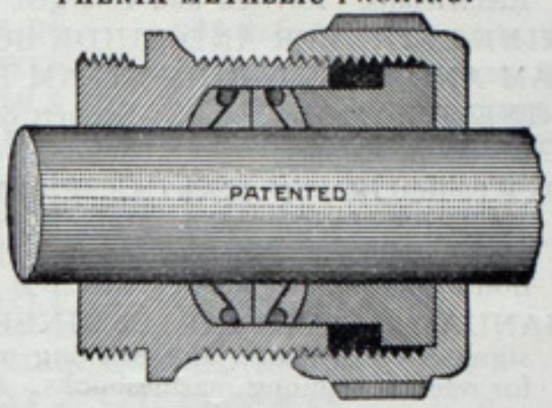

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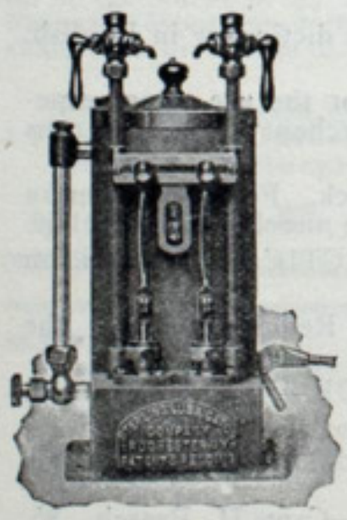

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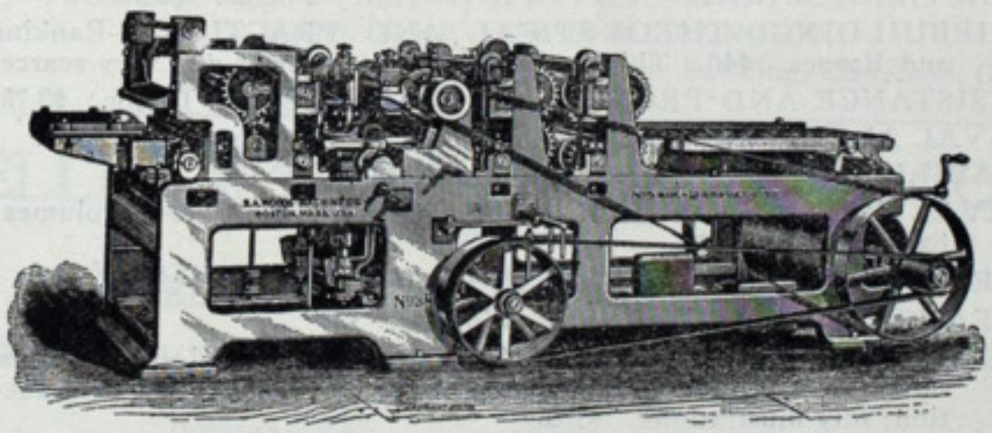

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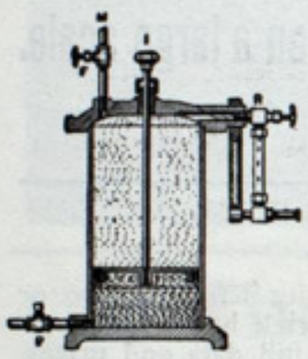

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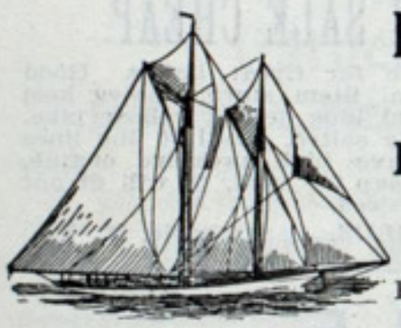

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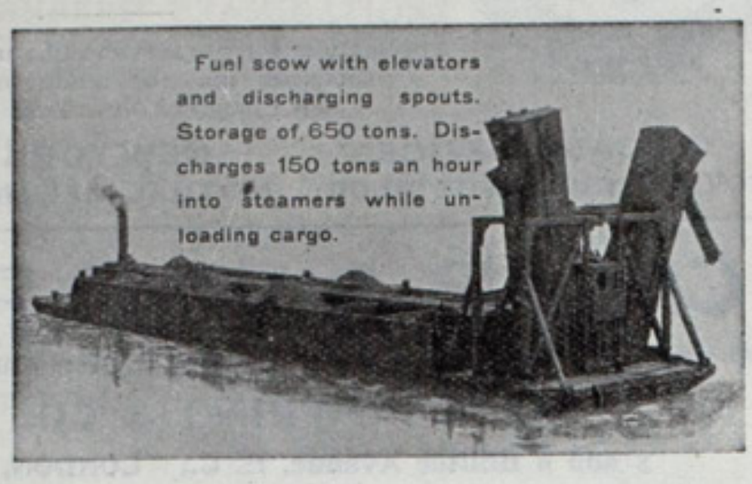

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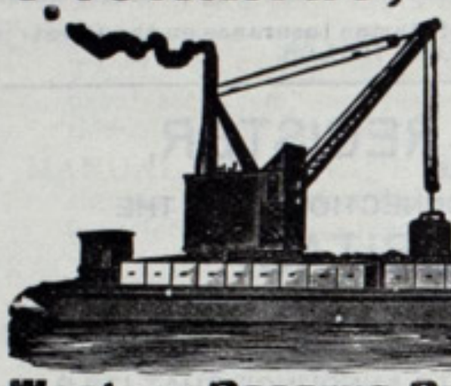

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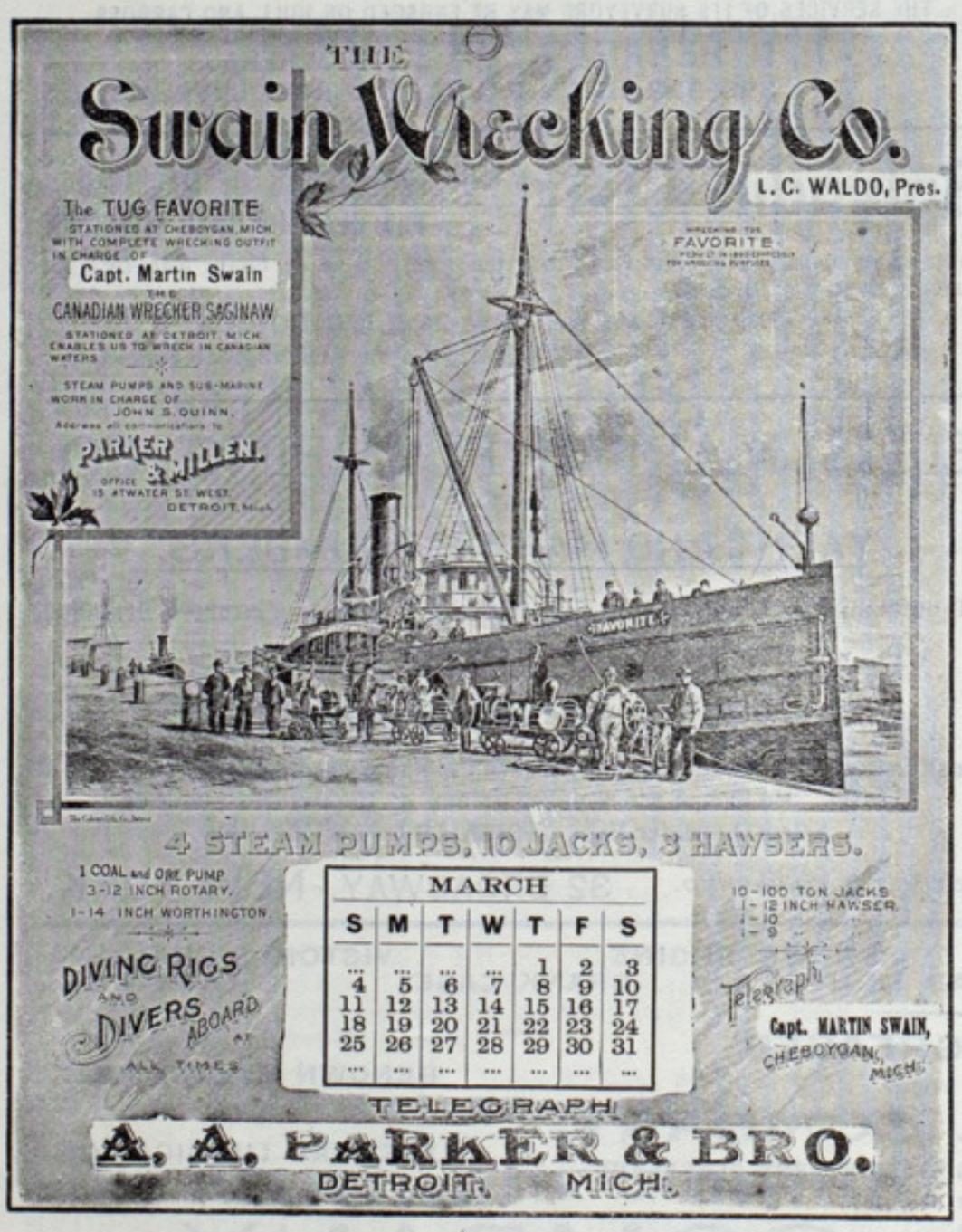

U. S. Engineer Office, 1637 Indiana Ave., Chicago., Ill., March 21, 1900. Sealed proposals for manufacture and erection of superstructure for double track Railroad Bridge across Illinois and Mississippi Canal near Wyanet, Ill., will be received here until 12 noon, April 10, 1900, and then publicly opened. Information furnished on application. J. H. Willard, Major, Engrs. Apr. 5.

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Sealed proposals will be received at the office of the Light-House Board until 2 o'clock, p. m., March 30, 1900, and then opened for furnishing the materials and labor of all kinds necessary for the construction and delivery of the steam wooden light-vessel, No. 74, delivered at the Buoy Depot at Little Diamond Island, Portland Harbor, Maine, in accordance with specifications, copies of which, with blank proposals and other information, may be had upon application to this office. F. J. Higginson, Rear Admiral, U. S. N., Chairman. Mar. 22.

U. S. Engineer Office, 1637 Indiana Ave., Chicago, Ill., March 15, 1900. Sealed proposals for constructing foundations for four arch culverts and for constructing fourteen pipe culverts under Illinois and Mississippi Canal and for other work and material of same character will be received here until 12, noon, April 16, 1900, and then publicly opened. Information furnished on application here or to Assistant Engineer L. L. Wheeler, Rock Falls, Ill. J. H. Willard, Maj., Engrs. April 5

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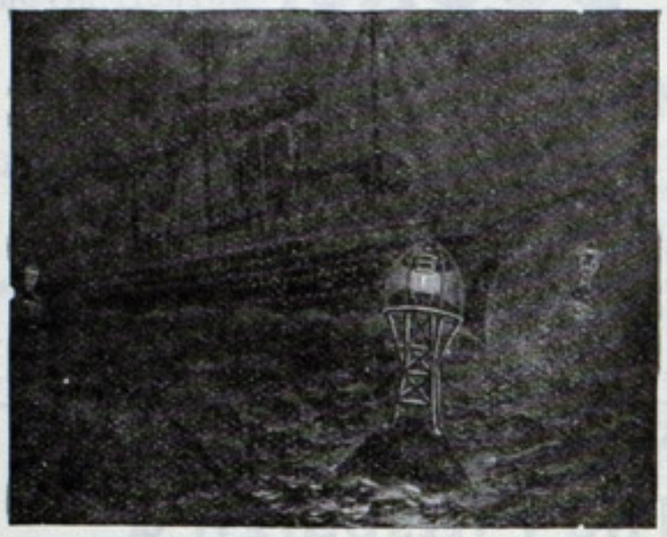

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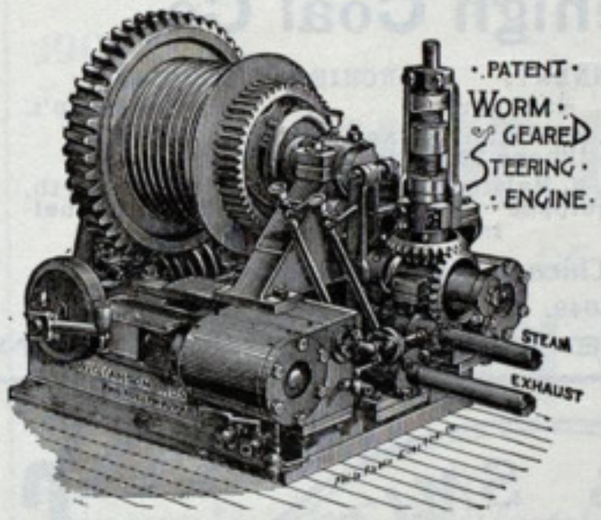

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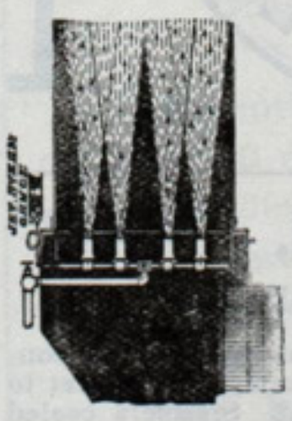

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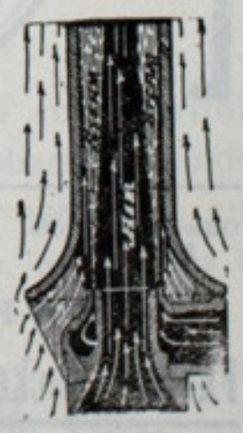

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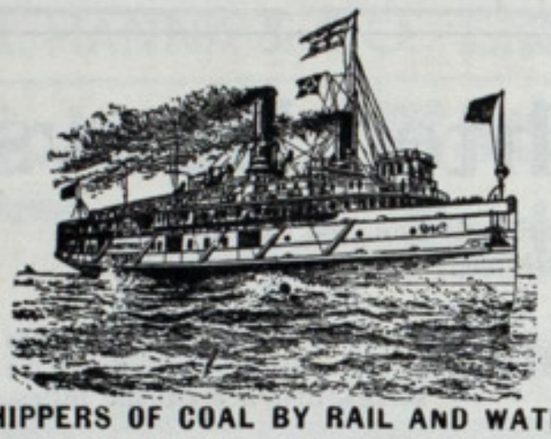

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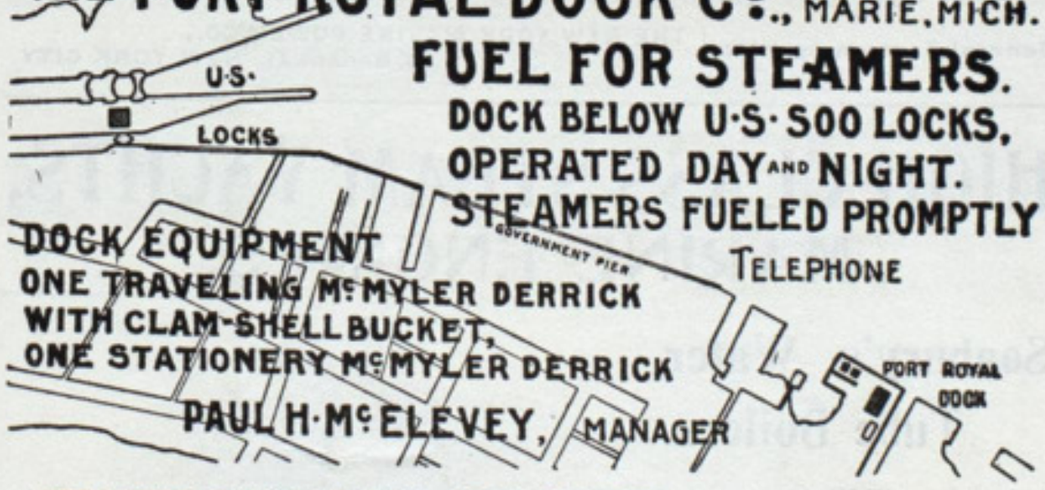

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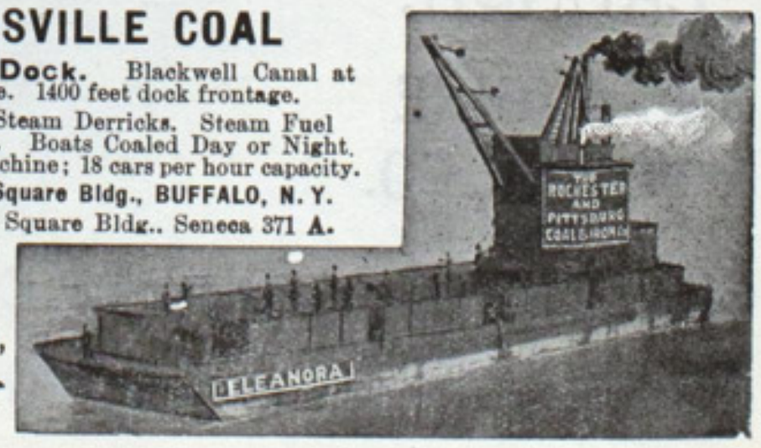

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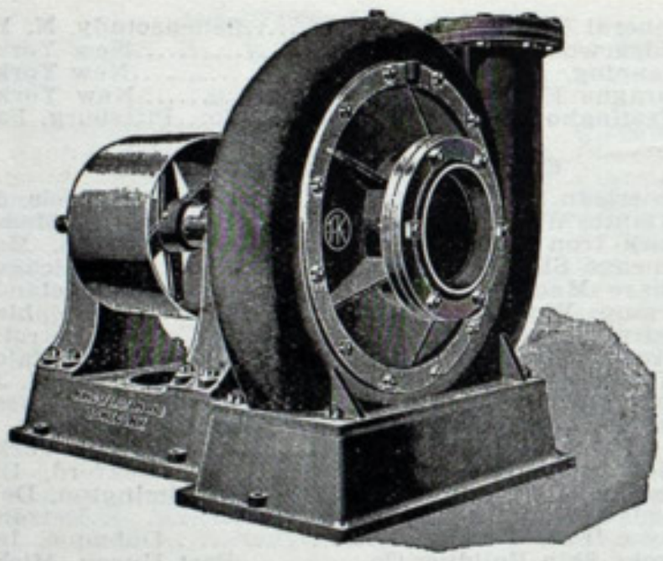

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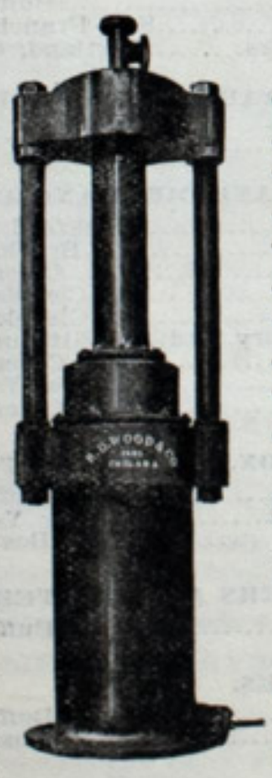

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Hoyt, Dustin & Kelley.....Cleveland.
Pinney, Orestes C.....Cleveland.
White, Johnson, McCaslin & Cannon.....Cleveland.

AXLES, SOLID AND HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

BABBITT METAL.

Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd....Philadelphia.

BAROMETERS, MARINE GLASSES, ETC.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.
Also most of the ship chandlers.

BENDING AND STRAIGHTENING ROLLS.

Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Hamilton, O.
New Doty Mfg. Co.....Janesville, Wis.

BLOCKS, SHEAVES, ETC.

Boston & Lockport Block Co.....Boston, Mass.
Cleveland Block Co.....Cleveland.
Donohue & Co., John T.....Baltimore.

BLOWERS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Lane & DeGroot.....Brooklyn.

BOILER MANUFACTURERS.

Almy Water Tube Boiler Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Babcock & Wilcox Co.....New York.
Bath Iron Works, Ltd.....Bath, Me.
Boyer Water Tube Boiler Co.....New York.
Chicago Ship Building Co.....Chicago.
Cramp, Wm. & Sons.....Philadelphia.
Delaunay, Belleville & Co.....St. Denis, France.
Detroit Screw Works.....Detroit.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co.....Morris Heights, N. Y.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Kingsford Found'y & Machine Works.Oswego, N. Y.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roberts Safety Water Tube Boiler Co....New York.
Stirling, The Co.....Chicago.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Watson, Egbert P.....Elizabeth, N. J.
Wolff & Zwicker Iron Works.....Portland, Ore.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works.....Chicago.

BOILER COMPOUND FEEDER.

Hall Compound Feeder Co.....Chicago.

BOILER TUBES, SEAMLESS, WELDLESS—Steel, Brass and Copper.

Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co.....New York.
Shelby Steel Tube Co.....Cleveland.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works.....New York.

BOILER STAYBOLT IRON.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BOLT CUTTERS.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

BORING AND TURNING MILLS.

American Tool Works Co. (The).....Cincinnati
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

BRASS AND BRONZE CASTINGS, SHEETS, RODS, ETC.

Ajax Metal Co.....Philadelphia.
Cory, Chas. & Son.....New York.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.

BRIDGES, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.
Scherzer Rolling Lift Bridge Co.....Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Mach. Co..Cleveland.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co.....Cleveland.

CAPSTANS.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

CHAINS.

Hayden, P., S. H. Co.....Columbus, O.
Lebanon Chain Works.....Lebanon, Pa.
Monongahela Iron & Steel Co. .....Pittsburg.

CHAIN HOISTS.

Boston & Lockport Block Co.....Boston, Mass.

CHRONOMETERS—SHIP CLOCKS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.
Also most of the ship chandlers.

CHUCKING MACHINES.

American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

CIRCULATOR EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H.....Newport News, Va.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Osborne, Saeger & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburgh & Chicago Gas Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co....Buffalo.
Youghiogheny & Lehigh Coal Co.....Chicago.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Lidgerwood Mnfg. Co.....New York.
McMyler Mnfg. Co.....Cleveland.
Webster, Camp & Lane Machine Co.....Akron, O.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

COMPASS ADJUSTER.

Simpson, Geo. A.....Sault Ste. Marie, Mich.

CONDENSERS.

See pumps, valves, steam specialties, &c.

COPPER AND SHEET IRON WORK.

Pusey & Jones Co.....Wilmington, Del.

CORDAGE.

American Mnfg. Co.....New York.
See also ship chandlers.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting & Conveying Mach. Co..Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
McMyler Mnfg. Co.....Cleveland.
Sprague Electric Co.....New York.
Webster, Camp & Lane Machine Co.....Akron, O.
Westinghouse Electric & Mnfg. Co. .....Pittsburg.

CRANK PINS.

Bethlehem Steel Co.....Bethlehem, So. Pa.

DECK PLANING MACHINERY.

Dallett, Thos. H. & Co.....Philadelphia.

DECK SEAMS, COMPOSITION FOR.

Cole & Kuhls.....Brooklyn, N. Y.

DRILLS—ROCK DRILLS, COAL CUTTERS, ETC.

Ingersoll-Sergeant Drill Co.....New York.

DRILLS, PNEUMATIC.

Chicago Pneumatic Tool Co.....Chicago.
Q. & C. Co.....Chicago.

DRILL PRESSES—DRILLS OF ALL KINDS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Manning, Maxwell & Moore.....New York.

DRYING APPARATUS.

Sturtevant Co., B. F.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Newport News Ship Bldg Co....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Townsend & Downey Ship Bldg. Co.....New York.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.

ELEVATORS.

Morse, Williams & Co.....Philadelphia.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co.....Buffalo.
General Electric Co.....Schenectady, N. Y.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co..Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Engine Co.....Weymouth, Mass.
Gas Engine & Power Co., and Chas. L. Seabury & Co., Consolidated.....New York.
Giddings & Stevens.....Rockford, Ill.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co..Philadelphia.
Newport News Ship Bldg Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Giddings & Stevens.....Rockford, Ill.
Hillman, Gustav.....Brooklyn.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Oldham, Joseph R.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.
Powell, Ambrose V.....Chicago.
See, Horace.....New York.
Wood, W. J.....Chicago.

FANS FOR VENTILATION, EXHAUST, ETC.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant Co., B. F.....Boston.

FORGINGS, IRON AND STEEL.

Bethlehem Steel Co.....South Bethlehem.
Bourne-Fuller Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.
Page Bros. & Co.....Boston.

FLUSHOMETERS.
Kenney, The Co.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas)..... Philadelphia.
Graham, James & Co.....Detroit.
Hanna, M. A. & Co.....Cleveland.
Hanlon, Mark H.....Cleveland.
Osborne, Saeger & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Port Royal Dock Co.....Sault Ste. Marie, Mich.
Pittsburgh & Chicago Gas Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co..Buffalo.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS ENGINES.
Garden City Motor Co.....Chicago.
Giddings & Stevens.....Rockford, Ill.
McMyler Mnfg. Co.....Cleveland.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Manning, Maxwell & Moore.....New York.
See also valves and steam specialties.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

HAMMERS, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.

HAMMERS, POWER DROP.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.

HEATING APPARATUS.
Sturtevant Co., B. F.....Boston.

HOISTING ENGINES.
American Ship Building Co.....Cleveland.
Brown Hoisting & Conveying Mach. Co..Cleveland.
Chase Machine Co.....Cleveland.
Donohue & Co., John T.....Baltimore.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Manning, Maxwell & Moore.....New York.
McMyler Mnfg. Co.....Cleveland.
Marine Iron Co.....Bay City.
Sprague Electric Co.....New York.
Williamson Bros.....Philadelphia.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE—AIR.
Chicago Pneumatic Tool Co.....Chicago.
Manning, Maxwell & Moore.....New York.
Philadelphia Pneumatic Tool Co.....Philadelphia.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Ashcroft Mnfg. Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Jenkins Bros.....New York.
Hayden & Derby Mnfg. Co.....New York.
Penberthy Injector Co.....Detroit.

INSURANCE, MARINE.
Bartow, J. H.....Cleveland.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hawgood & Moore.....Cleveland.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Myers, James A.....Chicago.
Osborn & Co., F. H.....Chicago.
Pauly, H. J.....Milwaukee.
Parker & Millen.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

LATHES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIFE BOATS—METALLIC.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.

LUBRICATING PUMPS.
Phenix Metallic Packing Co.....Chicago.
Sterling Lubricator Co.....Rochester, N. Y.

MACHINE TOOLS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Ajax Metal Co.....Philadelphia.
Cramp, Wm. & Sons.....Philadelphia.
Illinois Smelting & Refining Works.....Chicago.
Magnolia Metal Co.....New York.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

NAPHTHA LAUNCHES.
Gas Engine & Power Co.....New York.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie & Sons, E. S.....Brookline, Mass.
Also most of the ship chandlers.

NAVAL ARCHITECTS.
Curr, Robert.....Cleveland.
Hillman, Gustav.....Brooklyn.
Kirby, Frank E.....Detroit.
Oldham, Joseph R.....Cleveland.
See, Horace.....New York.
Wood, W. J.....Chicago.

NICKEL STEEL FORGINGS.
Bethlehem Steel Co.....So. Bethlehem, Pa.

OAK, TIMBER AND PLANK.
Martin-Barriss Co.....Cleveland.

OILS AND LUBRICANTS.
Dixon Crucible Co., Jos.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Phenix Metallic Packing Co.....Chicago.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Smith, Edward & Co.....New York.
Upson-Walton Co.....Cleveland.

PAINTING MACHINES, PNEUMATIC.
Chicago Pneumatic Tool Co.....Chicago.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.

PLANERS OF ALL KINDS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

PLUMBING, MARINE.
Ellis Marine Plumbing Co.....New York.
Mott Iron Works, J. L.....New York.
Sands, Alfred B. & Son.....New York.
Kenney, The Co.....New York.

PNEUMATIC TOOLS.
Chicago Pneumatic Tool Co.....Chicago.
Manning, Maxwell & Moore.....New York.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.

POCAHONTAS COAL.
Castner, Curran & Bullitt.....Philadelphia.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston, Mass.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg Co...Philadelphia.
Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

PROJECTORS, ELECTRIC.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Davidson, M. T.....Brooklyn, N. Y.
Donohue & Co., John T.....Baltimore.
Kingsford Foundry & Machine Works..... Oswego, N. Y.
Van Duzen, The E. W. Co.....Cincinnati.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Long & Allstatter Co.....Cincinnati.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Wood & Co., R. D.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Chicago.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Aut. Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland

RIVETERS.
See punches, riveters and shears.

ROPE.
American Mnfg. Co.....New York
See also ship chandlers.

RUBBER INSULATED WIRES.
Roebling's Sons, John A..New York and Cleveland.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Consolidated Safety Valve Co.....New York.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SCREW MACHINES.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Manning, Maxwell & Moore.....New York.

SEARCH LIGHTS.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works..Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.
Manning, Maxwell & Moore.....New York.

SHEARS.
See punches, riveters and shears.

SHEAVES, BALL BEARING.
Donohue & Co., John T.....Baltimore.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
McWilliams, Frank.....1 Broadway, New York.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SLING FRAME FOR HANDLING BARRELS.
Patriarche, H. R.....Milwaukee.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLT IRON, HOLLOW AND SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAMSHIP LINES, PASS. AND FREIGHT.
American Line.....New York.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.
Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.
Williamson Bros.....Philadelphia.

STOKERS FOR MARINE SERVICE.
American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.
Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.
Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.
Oldham, Joseph R.....Cleveland.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.
Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.
Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
Long & Allstatter, The Co.....Hamilton, O.
Manning, Maxwell & Moore.....New York.
New Doty Mnfg. Co.....Janesville, Wis.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Q. & C. Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING, STEEL, COPPER AND BRASS.
Atlantic Tube Co.....Pittsburg.
Hungerford Brass & Copper Co., U. T...New York.
Merchant & Co., Inc.....Philadelphia.
Shelby Steel Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.
Manning, Maxwell & Moore.....New York.

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Smith, Edward & Co.....New York.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

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Bartow, J. H.....Cleveland.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Miller, Bull & Knowlton.....New York.
Mitchell & Co.....Cleveland.
Myers, James A.....Chicago.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.
Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

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American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

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Woods Machine Co., S. A.....So. Boston.

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Morse, Williams & Co.....Philadelphia.

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Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Salvage Association of No. America.....Chicago.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.
See also ship chandlers.

YACHT AND BOAT BUILDERS.
Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YAWLS.
Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Ajax Metal Co. 36
Almy Water Tube Boiler Co. 9
American Line 27
American Mnfg. Co. 23
American Ship Building Co. 1
American Ship Windlass Co. 2
American Steam Gauge Co. 1
American Steel & Wire Co. 1
American Stoker Co. 3
American Tool Works Co. 21
Armstrong Cork Co. 36
*Ashcroft Mnfg. Co. 8
Ashton Valve Co. 10
Atlantic Works 5
Atlantic Tube Co. 25

Babcock & Wilcox Co. 9
Baldt Anchor Co. 7
Ball Bearing Co., Boston, Mass. 1
Baker, Howard H. & Co. 7
Bartow, J. H. 24
Bath Iron Works, Ltd. 1
Bement, Miles & Co. 3
Berlin Iron Bridge Co. 6
Bertram's Oil Polish Co. 1
Bessemer Steamship Co. 28
Bethlehem Steel Co. 6
Blake, Geo. F., Mnfg. Co. 7
*Bliss, John & Co. 31
*Bloomsburg & Co., H. 29
Boland, J. J. 24
*Boston & Lockport Block Co. 36
*Boyer Water Tube Boiler Co. 29
Bourne-Fuller Co. 10
Brown & Co. 24
Brown Hoist'g & Convey'g Mach Co 2
Buffalo Forge Co. 10

Castner, Curran & Bullitt 30
Chase Machine Co. 6
Chelsea Clock Co. 35
*Chicago Pneumatic Tool Co. 29
Chicago Ship Building Co. 2
*Cleveland Punch & Shear Wks. Co. 31
C. C. C. & St. L. R. R. 35
Conners, W. J. 24
Cole & Kuhls 27
*Consolidated Safety Valve Co. 8
Continental Iron Works 2
Cory, Chas. & Son 8
*Craig Ship Building Co. 31
Cramp, Wm., & Sons, S. & E. B. Co. 1
Crosby Steam Gage & Valve Co. 10
Crowl, Samuel H. 24
Curr, Robert 24

Dallett, Thos. H. & Co. 8
Davidson, M. T. 7
Delauney, Belleville & Co. 22
Detroit Shipbuilding Co. 1
Detroit Screw Works 9
Dearborn Drug & Chemical Works. 31
Delaware River Iron S. B. & E. Wks 5
Dixon, Jos., Crucible Co. 7
Donnelly Salvage & Wrecking Co. 28
Donohue & Co., John T. 36
Drake & Maytham 24
Drein, Thos. & Son 9

Ellis Marine Plumbing Co. 27
Elphicke, C. W. & Co. 24

Farrar & Trefts 4
Falls Hollow Staybolt Co. 4
Fletcher, W. & A. Co. 5
Fore River Engine Co. 5
Fogg, M. W. 29

Garden City Motor Co. 29
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated. 29
General Electric Co. 6
Gibbs & Joys 24
Giddings & Stevens 4
Gilchrist, Albert J. 24
Goulder, Harvey D. 24
Graham, James & Co. 30
Great Lakes Register 27

Hall & Root 24
Hall Compound Feeder Co. 27
Hanna, M. A. & Co. 28
Hanlon, Mark H. 30
Harlan & Hollingsworth Co., The. 5
Hawgood & Moore 24
*Hayden & Derby Mnfg. Co. 8
Herriman, F. D. 27
Hillman, Gustav 24
Hodge, S. F. & Co. 25
Holmes, Samuel 24
Hoyt, Dustin & Kelley 24
Hungerford Brass & Copper Co., U. T. 3
Hunt, Robert W. & Co. 24
Hutchinson & Co. 24
Hyde Windlass Co. 36

Illinois Smelting & Refining Works. 36
Ingersoll-Sergeant Drill Co. 28
International Anchor Co. 7
International Navigation Co. 27
Iowa Iron Works 5

Jenkins Brothers 4-8
Jenks Ship Building Co. 35

Kahnweiler's Sons, David 4
Katzenstein, L. & Co. 4
Keith, J. G. & Co. 24
*Kenney Co, The 23
Keystone Engine & Machine Works 6
Kingsford Foundry & Mach. Works 31

Lane & DeGroot 9
*Learmonth, Robert 31
Lebanon Chain Works 5
Lidgerwood Mfg. Co. 6
Long & Allstatter Co. 23
L. S. & M. S. Ry. 33

McMyler Mfg. Co. 4
McWilliams, Frank 5
MacKinnon Mfg. Co. 4
*Magnolia Metal Co. 1
Mair, John & Son 6
Manning, Maxwell & Moore 3
Marine Iron Co. 4
Martin-Barriss Co. 7
Maryland Steel Co. 5
Miller, Bull & Knowlton 24
Miller, Walter 7
Mitchell & Co. 24
Monongahela Iron & Steel Co. 3
*Moran Bros. Co. 35
Morse Iron Works & Dry Dock Co. 25
Morse, Williams & Co. 7
Mott Iron Works, J. L. 8
Myers, James A. 24

Neafie & Levy Ship & Eng. Bldg. Co. 5
Newport News Ship Building & Dry Dock Co. 5
New Doty Mfg. Co. 10
Nixon, Lewis 5
North River Iron Works 5

Oldham, J. R. 24
Osborne & Co., F. H. 24
Osborne, Saeger & Co. 30

Page Bros. & Co. 4
Parker, A. A. & Bro. 27
Patriarche, H. R. 10
Pauly, H. J. 24
Peck, Chas. E. & W. F. 27
*Penberthy Injector Co. 35
Phenix Metallic Packing Co. 25
Philadelphia Pneumatic Tool Co. 8
Phosphor Bronze Smelting Co. Ltd. 7
Pickands, Mather & Co. 28
Pinney, Orestes C. 24
Pittsburgh & Chicago Gas Coal Co. 30
Pittsburgh Testing Laboratory, Ltd 24
Playfair's Barge & Tug Line. 36
Powell, Ambrose V. 24
Port Royal Dock Co. 30
Pusey & Jones Co. 5

Q. & C. Co. 23
Queen City Engineering Co. 8

Richardson, W. C. 24
*Ritchie & Sons, E. S. 29
Roach's Ship Yard 5
Roberts Water Tube Boiler Co. 9
Red Star Line 27
*Roebling's, John A. Sons Co. 36
Rochester & Pittsburgh Coal & Iron Co. 30
Rushmore Dynamo Works 6

Safety Car Heating & Lighting Co. 29
Salvage Association of No. America 27
Sands, Alfred B. & Son 8
Scherzer Rolling Lift Bridge Co. 6
See, Horace 24
Shelby Steel Tube Co. 25
Sheriffs Mfg. Co. 8
Simpson, Geo. A. 22
Smith, Edward, & Co. 1
Smith, Stanley B. & Co. 30
Standard Automatic Releasing Hook Co. 4
Standard Oil Co. 27
Sterling Lubricator Co. 25
Stirling Co. 9
Sturtevant, B. F. Co. 36
Swain Wrecking Co. 28

Thurston & Bates 24
Townsend & Downey Ship Bldg. Co. 10
Trigg Co., Wm. R. 3
Trout, H. G. 7
Union Dry Dock Co. 2

Union Iron Works 5
Upson-Walton Co. 36
U. S. Metallic Packing Co. 36

Van Duzen Co., The E. W. 7

Watson, Egbert P. 9
Webster, Camp & Lane Machine Co. 3
Westinghouse Electric & Mfg. Co. 6
White, Johnson, McCaslin & Cannon 24
Williamson Bros. 29
Wilson, Thomas 24
Wilson & Silsby 6
Wolff & Zwicker Iron Works 5
Wood, W. J. 24
*Wood & Co., R. D. 31
Woods Machine Co., S. A. 25
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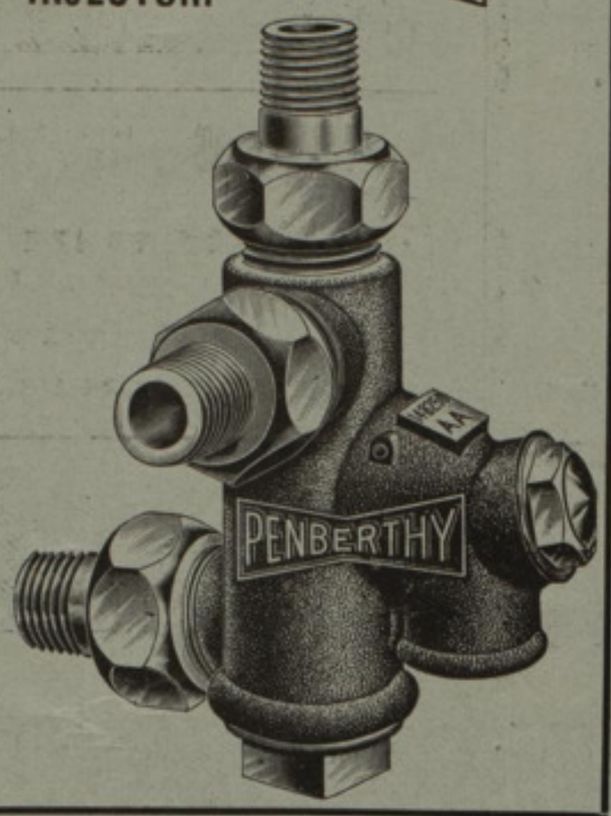

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No. 32,	Fast Mail	*11 20 am	*11 25 am
No. 44,	Accom. via Sandusky.....	†1 15 pm	.....
No. 46,	Southwestern Express	.....	*3 00 pm
No. 6,	Limited Fast Mail.....	*5 40 pm	*5 45 pm
No. 10,	C., N. Y. & Boston Special	*7 35 pm	*7 40 pm
No. 2,	Day Express	†9 10 pm	†9 35 pm
No. 126,	Norwalk Accommodation..	†7 55 am	.....
No. 40,	Tol. & Buff. Ac., v. Norw'k	†10 00 am	†10 30 am
No. 116,	Conneaut Accommodation.	.....	†4 30 pm
		Arrive from East.	Depart West.
	Westward:—		
No. 11,	Southwestern Limited.....	*3 20 am	.....
No. 15,	N. Y., Bos. & Chi. Spl.....	*3 55 am	*4 05 am
No. 7,	Day Express	.....	†6 30 am
No. 19,	The Lake Shore Ltd.....	*7 45 am	*7 50 am
No. 23,	Western Express	*11 10 am	*11 15 am
No. 33,	Southwestern Express.....	*11 25 pm	.....
No. 31,	United States Express.....	.....	*12 10 pm
No. 47,	Accommodation	.....	†3 00 pm
No. 141,	Sandusky Accommodation.	.....	†3 10 pm
No. 127,	Norwalk Accommodation..	.....	†5 10 pm
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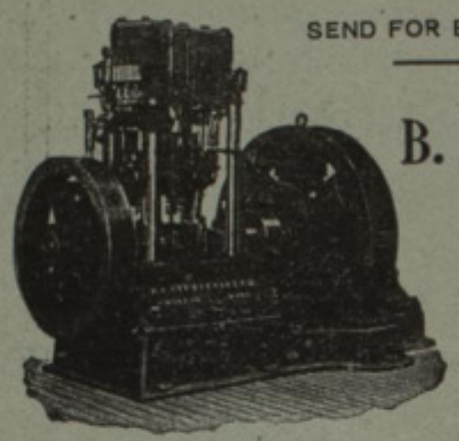

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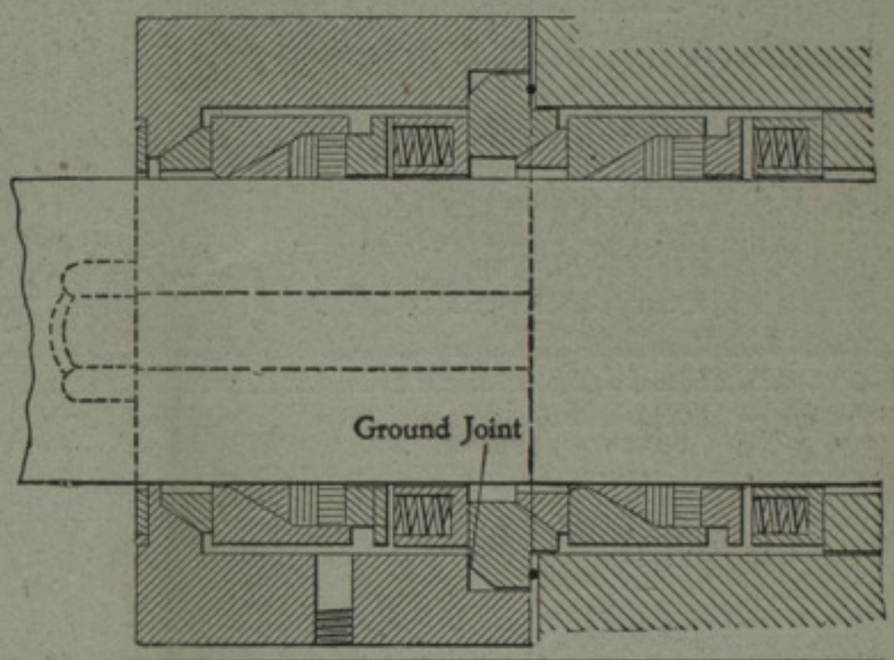

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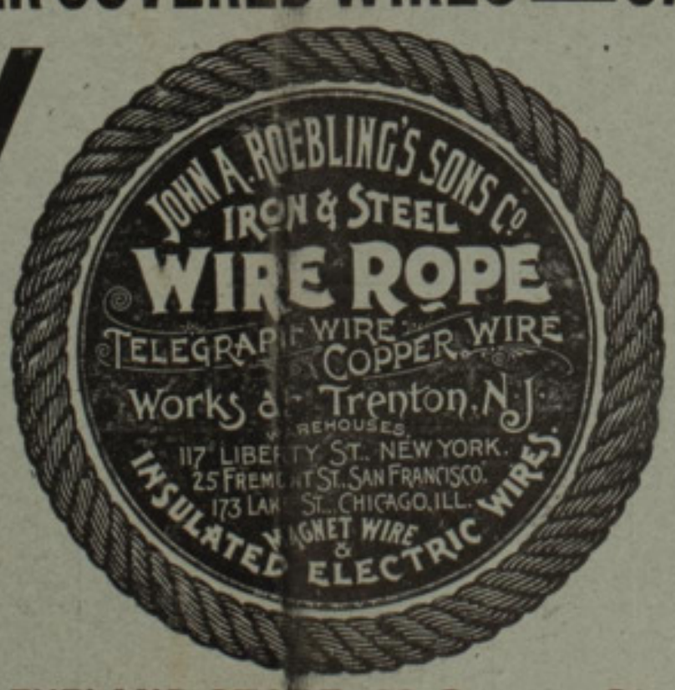

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VOL. XXI. CLEVELAND, O., MARCH 22, 1900. No. 12.

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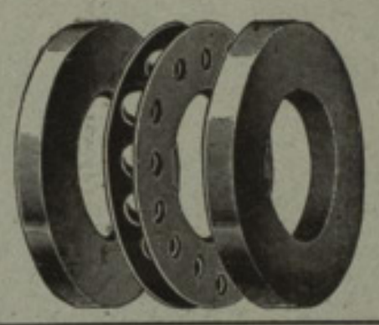

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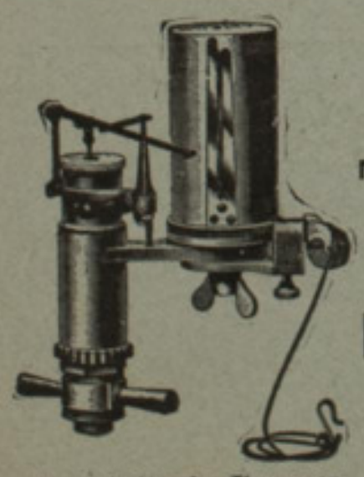

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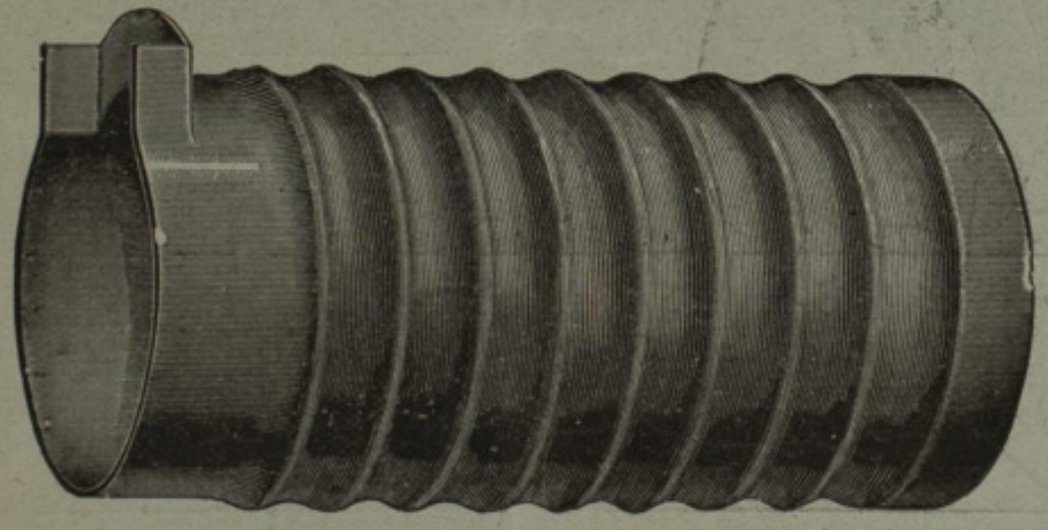

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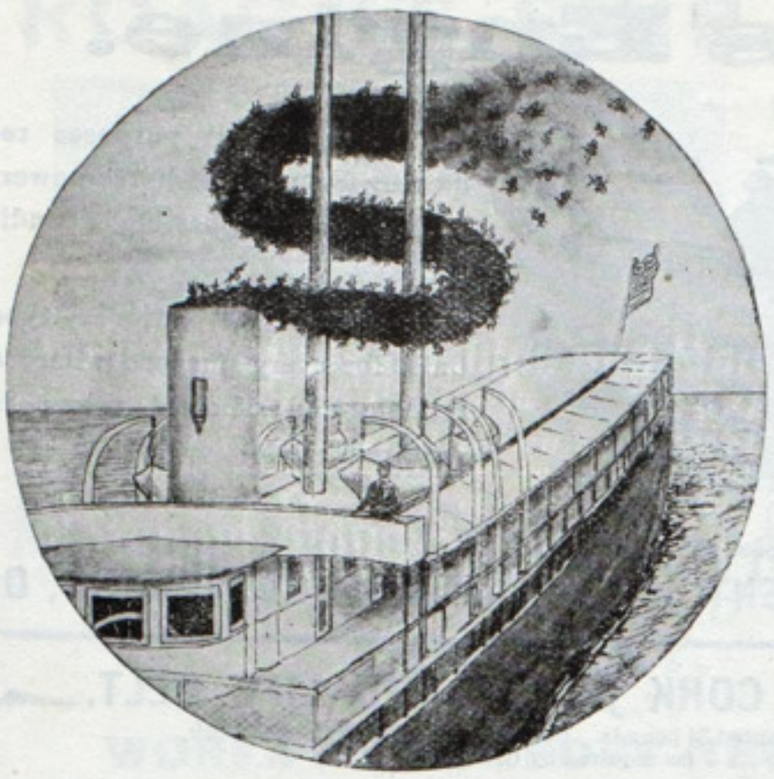

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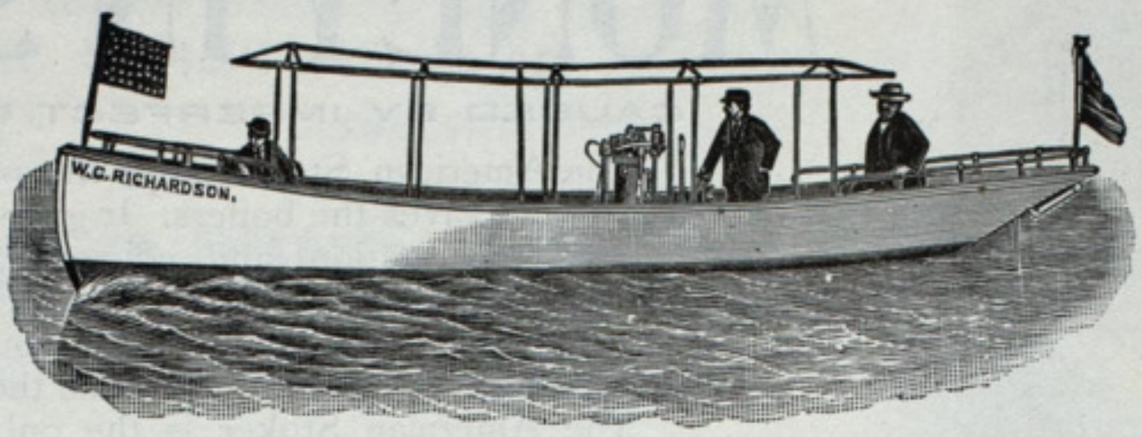

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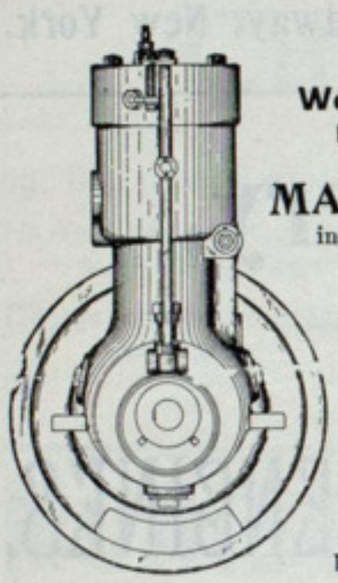

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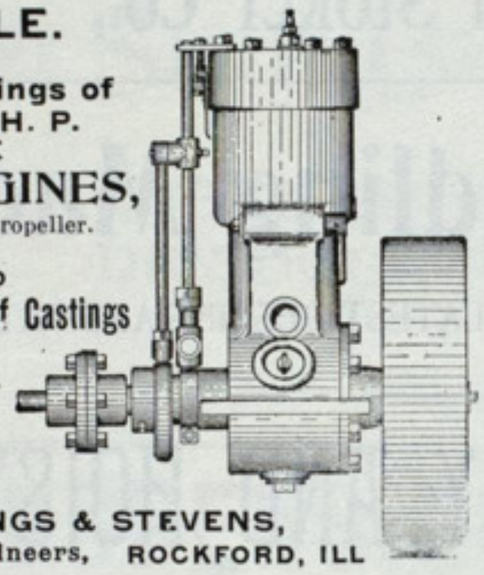

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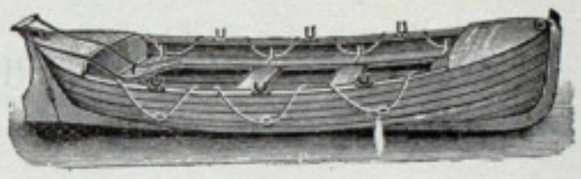

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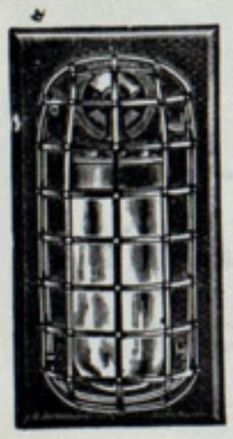

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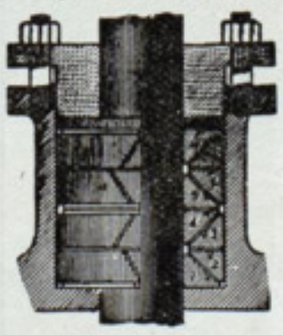

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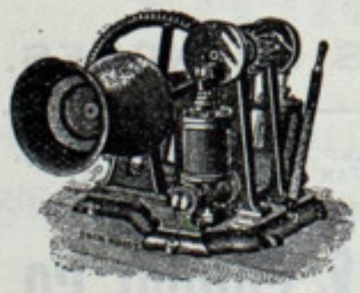

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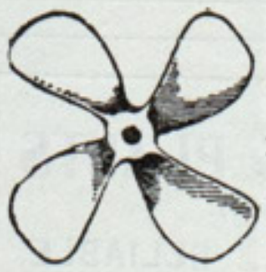

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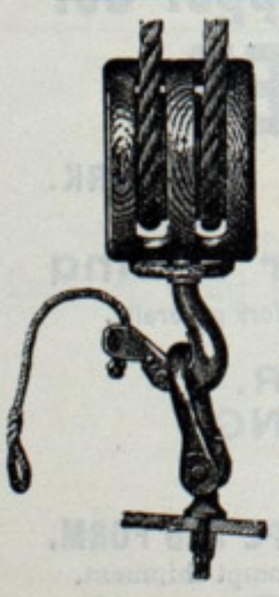

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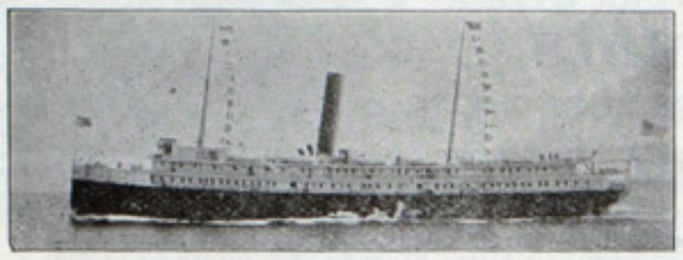

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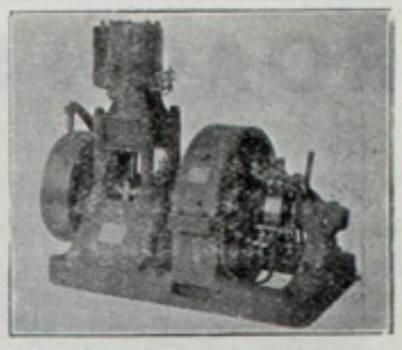

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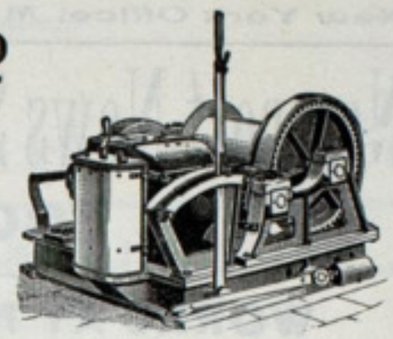

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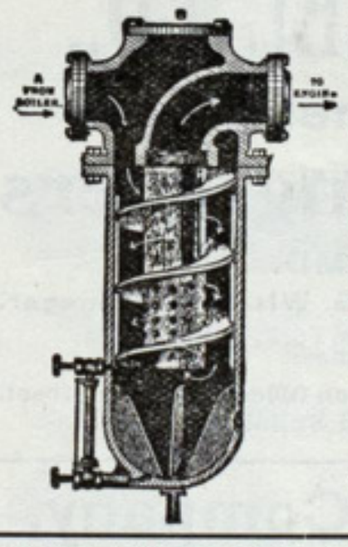

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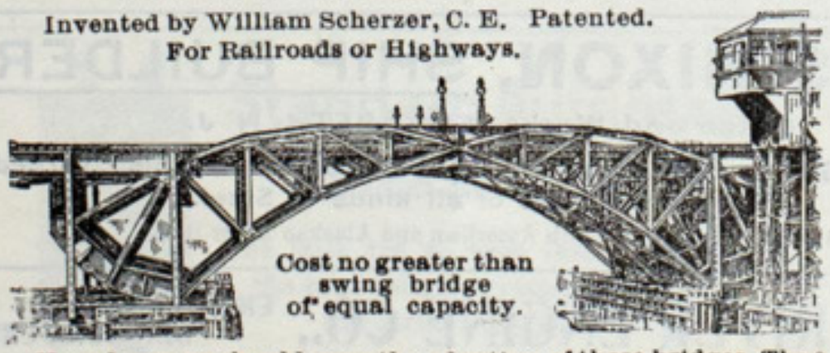

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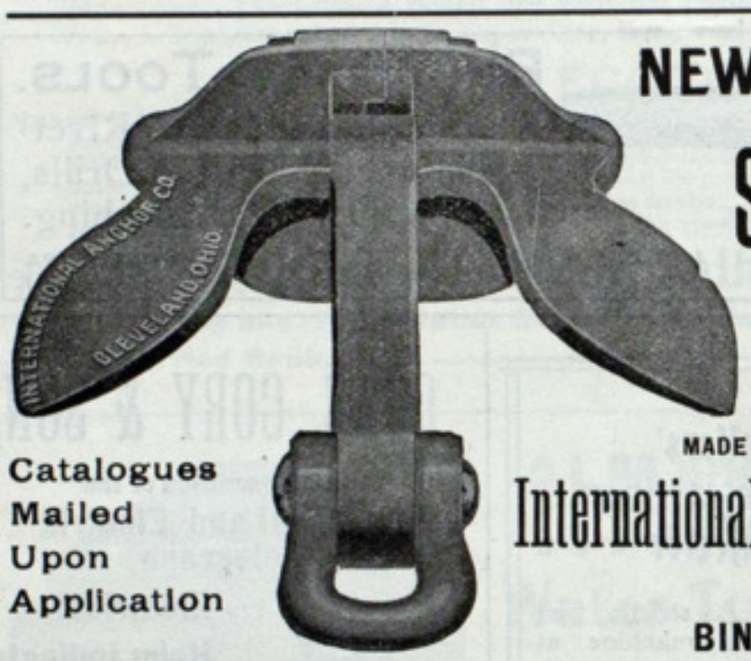

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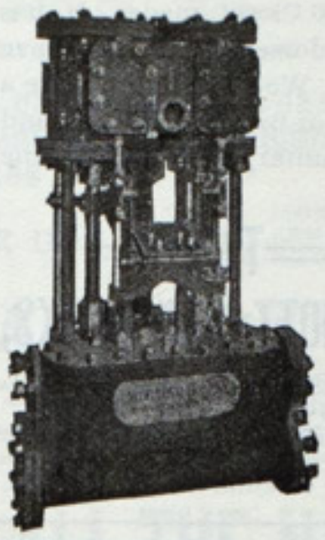

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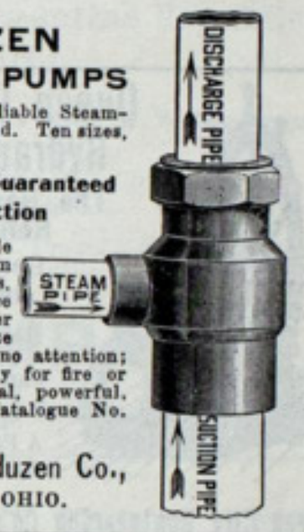

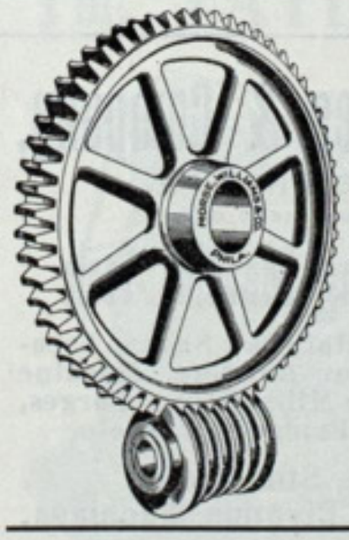

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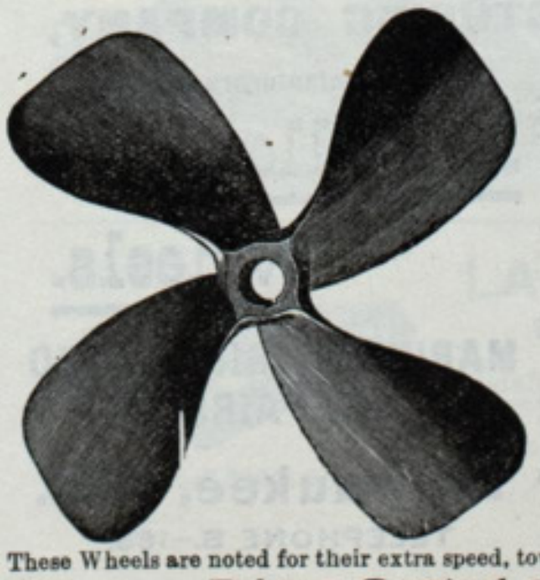

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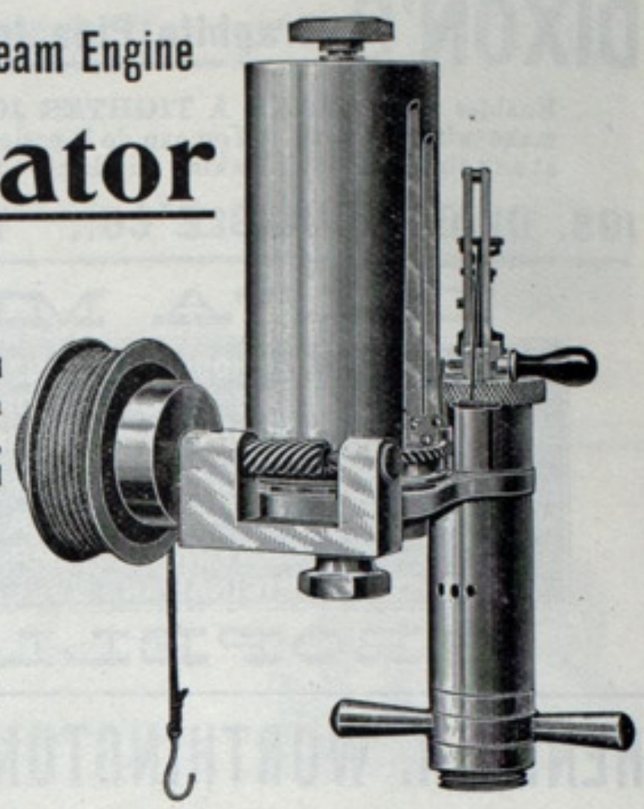

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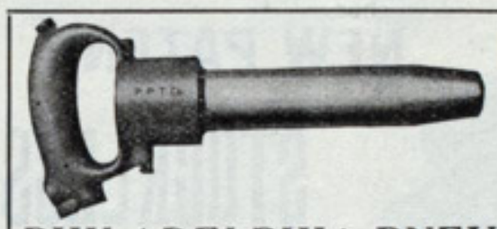

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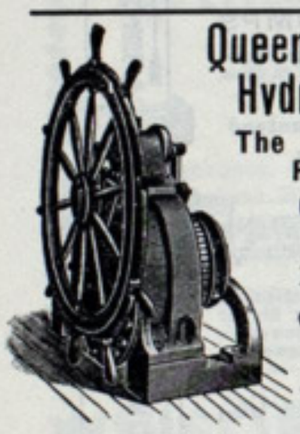

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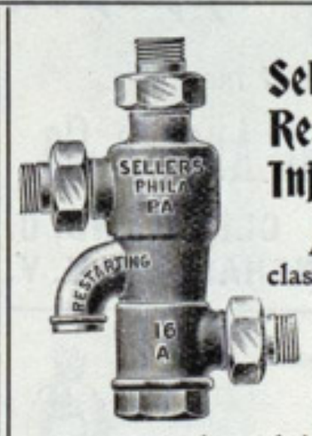

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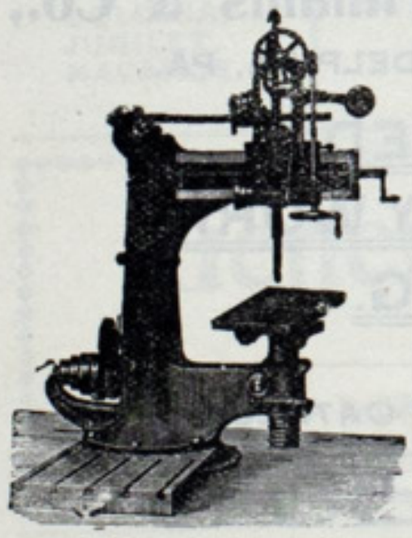

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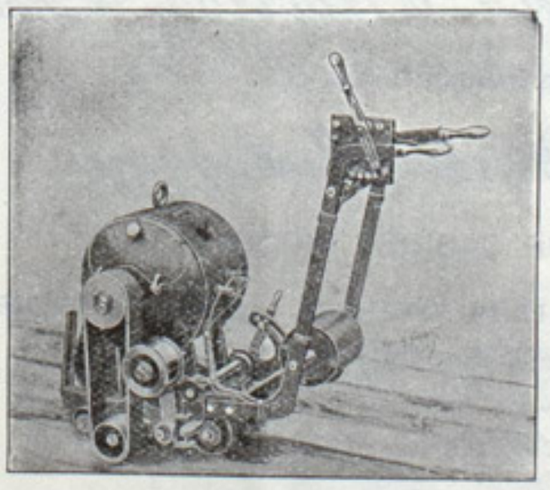

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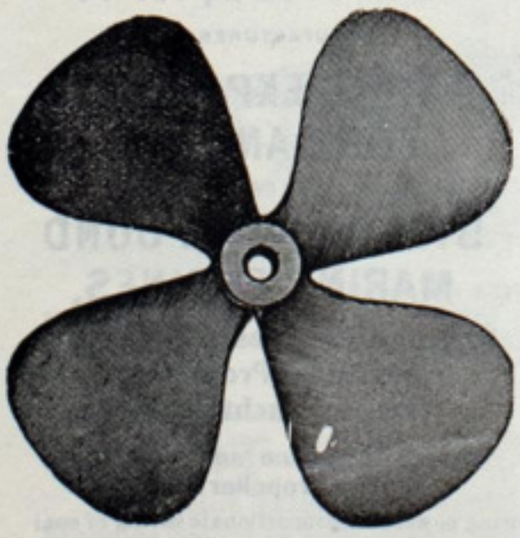

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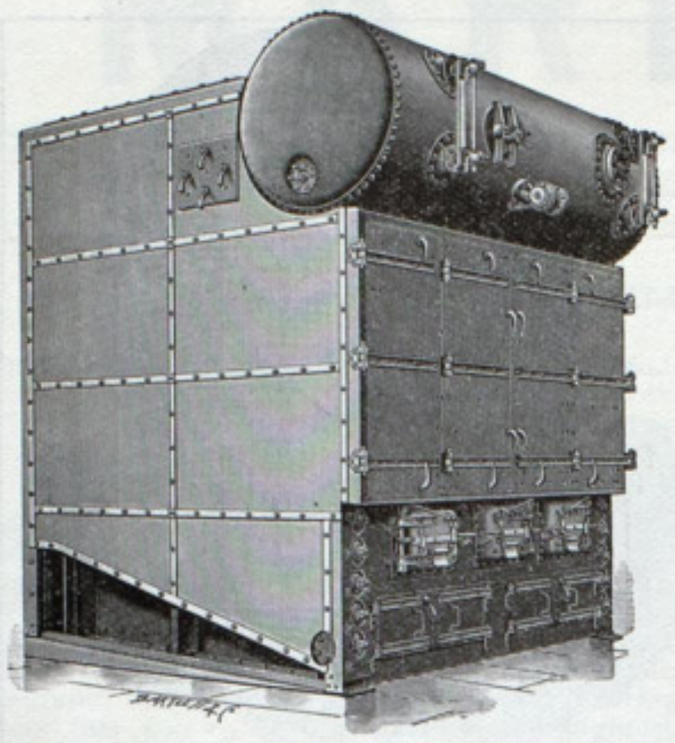

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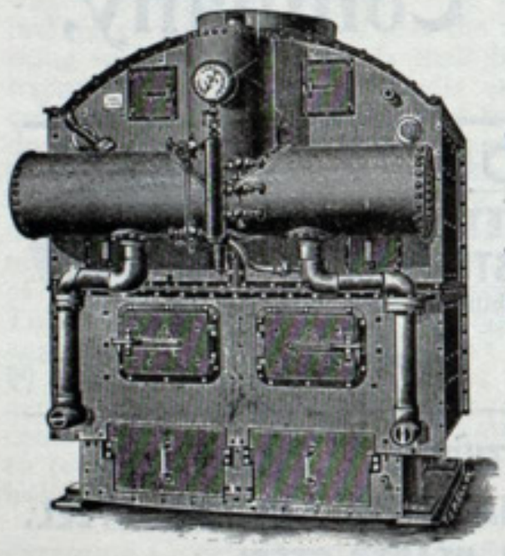

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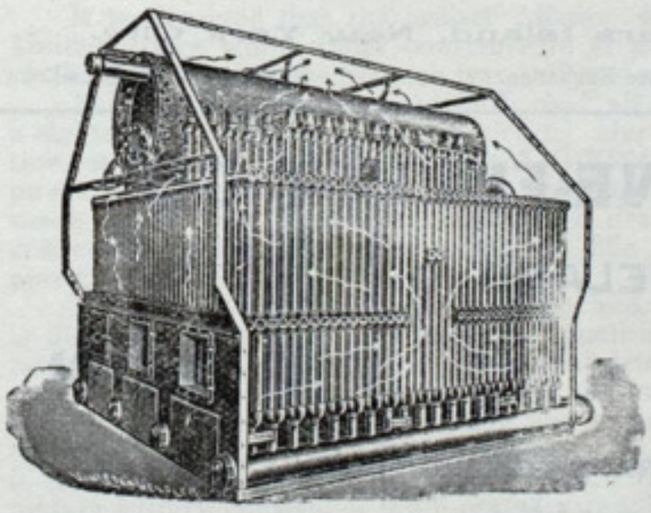

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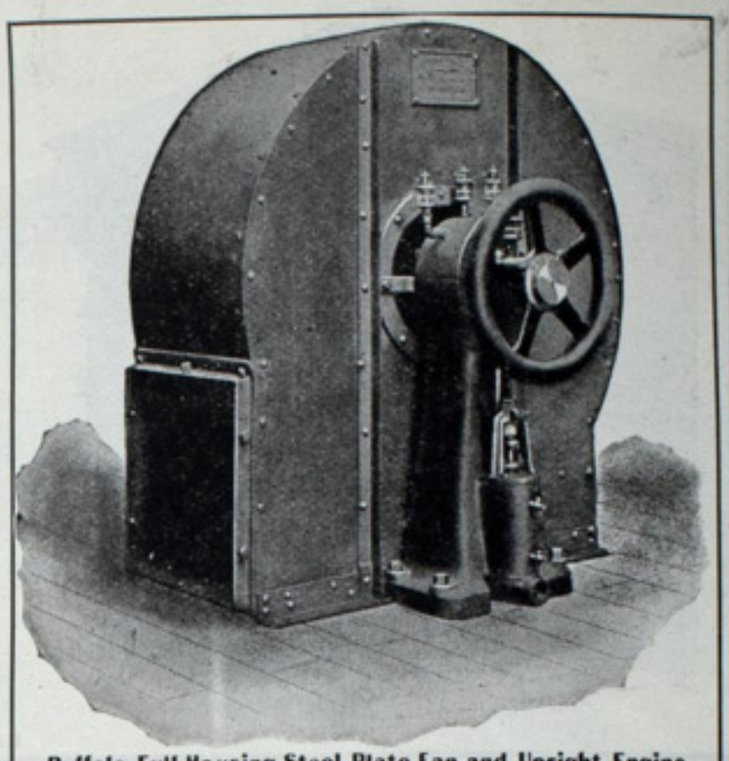

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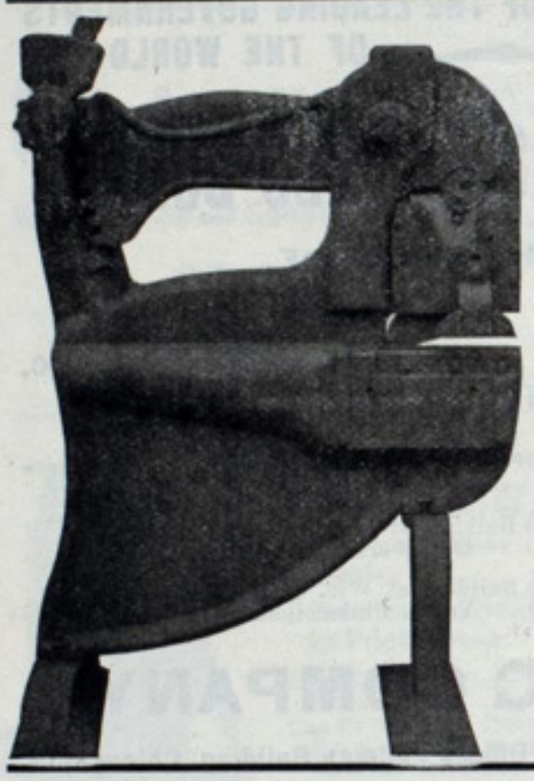

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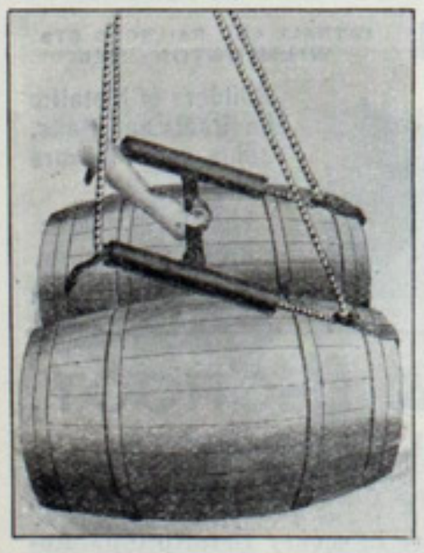

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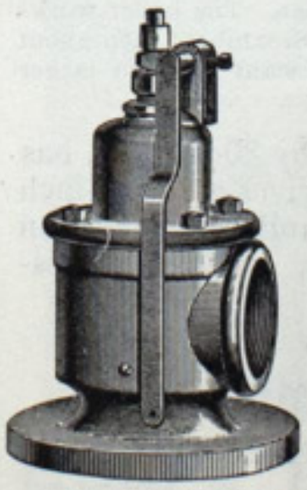

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